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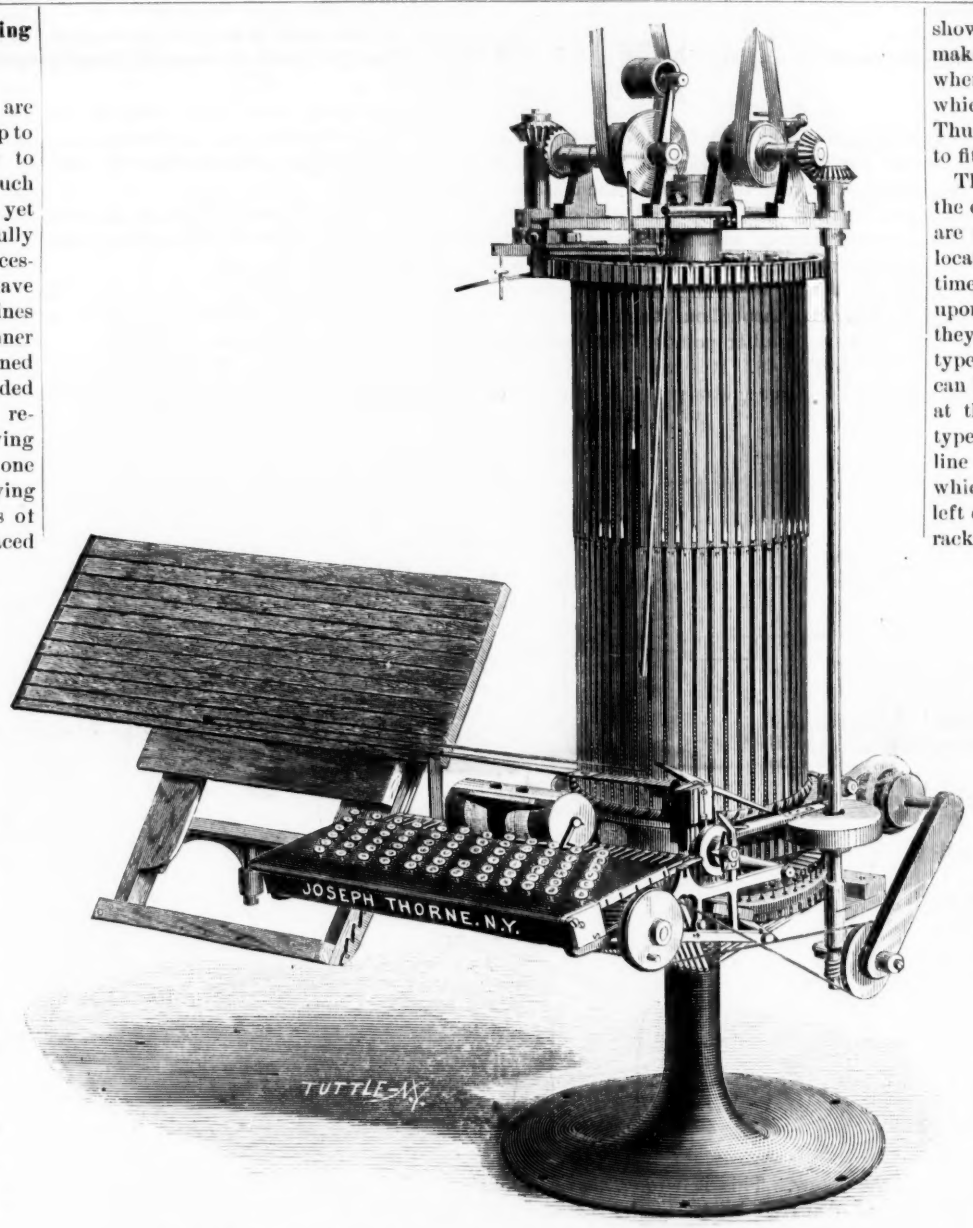
Combined Type-Setting and Distributing Machine.

The setting and distributing of type are two processes in which hand work has up to the present time been found superior to machinery. These processes involve such immense details that no machine has as yet been invented that would successfully accomplish all that can be, and is of necessity done by hand. Frequent attempts have been made by inventors to construct machines which would perform in a reliable manner as many of the numerous details mentioned as possible, which efforts have been attended with varying degrees of success. A remarkably successful machine embodying these desirable features is represented one twelfth the actual size, by the engraving upon this page. This machine consists of two cast iron cylinders of equal size placed one above the other, as shown in the engraving. They are supported by means of a vertical wrought iron shaft fitted to slide freely up and down in a cast iron stand provided with bolt holes for fastening to the floor. By means of the sliding vertical shaft the machine can be set to bring the key-board at any height desired to suit the taste of the operator, and it is held in such position by set screws. The upper cylinder revolves while the lower one remains stationary. Both cylinders have channels placed tangentially like the teeth of a saw.



COMBINED TYPE-SETTING AND AUTOMATIC DISTRIBUTING MACHINE.

The type used upon this machine each have two features by which they are identified, viz.: their faces, by which all ordinary type are distinguished, while the other and peculiar characteristic is a specified number of nicks, or square notches, cut in their edges. All these type have the same number of notches, but their distance apart is varied upon each letter so that no two, unless of the same kind, are alike.

The channels in the upper cylinder are smooth so that they may be filled with type of all kinds from a holder placed upon a frame for that purpose at the back of the machine. This cylinder is moved forward by a catch attached to a vibrating arm at the top. This arm is caused to vibrate by an eccentric upon the bottom of a spindle driven by the bevel gears shown. The power is derived from a belt upon tight and loose pulleys. The catch engages teeth cut in the edge of top cylinder also shown.

From this description the reader will understand that this cylinder, instead of having a steady or continuous rotary movement, has a hitching motion given to it by the catch to which allusion has been made, so that at each motion the channels in the upper cylinder are brought directly opposite those in the lower cylinder. Each of these channels has parallel projections at one side to fit the notches cut in some particular letter or type.

No two of these grooves are alike, and, as the top cylinder revolves, the type are carried along, sliding upon the top of the bottom cylinder until they come to their respective channels, when they drop by gravity into their places in the composing case or lower cylinder, thus continuing until all are distributed. The cylinder remains at rest long enough for any number of letters to drop. As the channels in the upper cylinder become empty, they are filled from the case mentioned in the following manner: The type are placed upon their sides in the holder, so that they would read vertically, and the first line is pushed through a slit in the holder into the channel. A wire fender is then lowered over the type to prevent them from slipping endwise out of the channel. One of these fenders is shown partly withdrawn in the front of the engraving. When any of the channels in the composing case gets full, the machine will stop, so that no damage will occur. Such, in brief, is the distributing part of this machine. Although it may appear somewhat complicated at first, it must be observed that it is simple and positive in its action, and it is absolutely impossible for letters or characters to get mixed, or for two, of different kinds, to drop into the same channels. What the guard is to a tumbler lock, the notches are to each particular type they are made to represent.

The distributing mechanism is automatic and independent, so that it may be used either while type are being set up or by itself, as desired.

The type-setting mechanism consists of the following parts: At the bottom of each of the channels in the lower cylinder is a little slide called a type ejector. These ejectors are each attached to one arm of a bell crank while the other arm is connected with a tappet under the key-board in front of the machine. A cylinder is placed under the key-board, having a number of strips of metal set into its face to engage projections upon the tappets, so that when a key is depressed a tooth upon the tappet engages one of these strips and compels a movement of the bell crank ejecting a type representing a letter corresponding to the one marked upon the key depressed upon the key-board. In depressing the key a pin in the end of the tappet is pressed into a slide which holds the tooth upon the tappet and the strip upon the cylinder in connection with each other until the movement of ejecting the type is completed.

Whenever a key is depressed by this positive movement there is no danger of failure to eject a type, which would in all probability occur were it not for this precaution.

The type, as it emerges from the bottom of the channel, is received upon the top surface of a revolving wheel, which is known as the rotating table. This table is caused to rotate by a gear upon the upright shaft shown at the right of the machine. The type make two complete circuits of the cylinder, when they are taken up by an endless belt which delivers them upon a packing wheel. Thus they are placed in line for justifying to fit any sized page desired.

The type are required to pass twice around the cylinder so that when two or more keys are depressed at one time, and the letters located at opposite sides of the cylinder, time will be allowed for them to assemble upon the rotating table in proper order before they are passed to the packing wheel. Any type or characters not in the composing case can be readily introduced from a case placed at the right hand of the operator. As the type issue from the packing wheel in a single line they pass through a setting-stick, from which they pass to the rack shown at the left of the machine. The lower space in this rack is first filled, after which a catch is depressed and the rack lowered in position to fill the next space, and so on until all the spaces have been filled.

All this may be readily accomplished by the operator without rising from his seat. The rack holds about 3,000 ems, small pica, and when full, it is removed and an empty one placed in its stead on the machine. This system of ejecting type by direct connection with keys as employed, affords a positive means of setting each type in its proper place in composition. The touch, however slight upon the key, will engage the connecting mechanism which ejects a type, so that it is not necessary to press each key a certain distance or a definite time, as after the first impulse the mechanism takes care of itself.

In using this machine one person can adjust while another sets up the type, and by this means the machine can be kept constantly at work. The copy is held upon a cylinder shown at the back of the key-board. This cylinder is hollow with a slit at one side, into the top edge of which the sheet containing the copy is inserted. Then by rotating the cylinder the copy is brought under the spring rest, exposing the first line above the rest. The type are handled in such a way that their faces are not injured by being brought into contact with any hard substances. After the first line has been set up, by rotating the cylinder the second line is exposed above the rest, and so on. Thus the operator has in front of him, first, the key-board, then the copy and finally the line of set up type, arranged one above the other, all in a direct line of vision.

All working parts of the machine are within easy reach of the operator without leaving his seat. The amount of work performed by this machine depends upon the skill of the operator. It will pack 5,000 ems into line per hour if skillfully played, and of course practice is understood to be all essential to the rapid setting of type. With the attention of an intelligent boy or girl this machine will distribute all the setter will set, without working more than three-quarters of the time. The machine is simple in detail, positive in its action and may be operated successfully by a person little used to machinery. The mechanical construction is such that any part can quickly be removed without dissecting the entire machine. Joseph Thorne of New York is the inventor and manufacturer.

Mechanical Drawing.

BY PROF. JOHN E. SWEET.

In the long interval since my last article on drawing appeared in the AMERICAN MACHINIST of Feb. 11th, I have many times begun sketching in hopes of continuing the subject, but with fruitless success.

The main purpose for which the lessons were commenced has long ago been accomplished, if it is to be accomplished at all; that is, the desire to get the apprentices and young workmen to using pencil, T square and paper; to get the students in our drawing schools to comprehend that to make their work of value they must think of the thing represented instead of the drawing itself, and that the drawing is for the purpose of conveying information instead of being made to please the eye.

In each of the lessons in drawing, in which there has been but here and there a hint as to how to draw, I have endeavored to convey some knowledge in regard to the subject, and in this part of the work the articles might end one time as well as another, or go on indefinitely, for it leads to the study of mechanics, and the subjects of mechanics are endless.

In the sketches of a small measuring machine which formed the subject of the illustrations in the last lesson, some things were omitted which are important to the proper use of the machine, and many points of merit in the machine were not hinted at in the sketches.

To make a measuring machine sufficiently accurate for the best of shop work, it is necessary that the machine should be as accurate as the man himself can work, and be influenced by changes of temperature to no greater extent than that of the work being done.

The machine, too, must be no more delicate than the men who are to use it. It should be so constructed as not to change its accuracy by wear; it should be easily adjusted and capable of proving its own accuracy.

How well these points may be covered in the machine shown the apprentice may settle for himself, by following carefully over the sketches with this description.

First. If the sketches have been rightly interpreted, it was seen that the measuring screw and nut are of equal length, both three inches long; next it will be seen by referring to the index that the screw is intended to measure but a single inch and moves back and forth through the nut ½ inch out at each end. The object of this is to insure continued accuracy. However much the screw and nut may wear they will never be less perfect than when made, and all measuring machines made with a long screw working in a short nut, if perfect when made, will wear more or less imperfect the longer they are used, that is if used more in one part than another (a condition unavoidable) or if they are not made of materials that do not wear (something that has not as yet been found).

Admitting the fact that the screw and nut must wear, means must be provided to compensate for that wear.

This is met by using a V thread and a nut that can be compressed by a clamp screw; this method is defective, for if the long nut is not clamped equally at each end, all the wear, both on the screw and nut, will occur at one end, to obviate which a thread having one square face, that is a ratchet thread, may be used.

A square thread cannot be used, because clamping the nut would not take up lost motion in the direction of its length.

A square thread might otherwise be used by the employment of a second nut to take up end play, but such a device must inevitably ruin the accuracy of the screw, by wearing more in one place than another. In

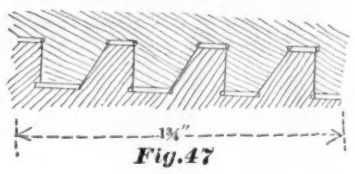


Fig.47

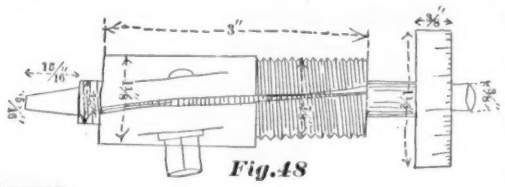


Fig.48

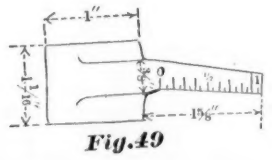


Fig.49

this view of the case I believe a thread of the form shown in Fig. 47 to be the only correct one, and that too with the bottom of the thread in both screw and nut cut away so as to admit of wear and the taking up of the lost motion without changing the shape of the thread or losing the bearing on the working face throughout its entire length.

There is another point of interest illustrated in Fig. 48. It is usual to split a nut for such a purpose straight with the center of the screw. This is wrong, as the split should be at right angles to the thread, and the binding screw set parallel with thread, as shown in Fig. 48. The reason for this will be apparent to the mechanic, and the student may profitably spend time on the investigation necessary to find it out.

In measuring machines where a screw is used as a dividing agent, the uniformity of the screw is a measure of the accuracy of the machine—or the imperfection in the screw must be determined and corrected by some outside device. When the screw and nut are of the same length and properly cut, the two may be ground together and so correct each other as to insure a great degree of accuracy so far as uniformity of pitch is concerned, but without any certainty of there being a given number of threads to the inch.

By using the form of index shown in Fig. 49, it matters not whether the screw has the required number of threads to the inch or not. To test the accuracy of the screw and to correct the error, it is only necessary to set the two measuring points (feelers) together and set the index, which is free to turn on the body of the machine, to coincide with the *O* on the dial—then turn back the screw 16 turns and try a standard 1″ gauge between the feelers. If the screw has to be turned either way to fit the gauge, then the screw is either too coarse or too fine pitch. To correct the error it is only necessary to cut the edge of the index at an angle more or less, as shown in Fig. 49, one way or the other, to make the machine measure correctly.

It may be noticed that the index is secured to the body of the instrument by being threaded upon a projecting boss through which the measuring screw is threaded. This is necessary, and to discover why it is so is another good study for the student.

While, as said above, the screw measures but a single inch, the machine measures up to 4,″ and might be made to measure any size.

For measuring sizes larger than an inch, the foot-stop is set back one, two or three inches by standard distance pieces, the index adjusted, and anything up to 4″ may be measured to the half thousandth by the marks on the dials, or to the 10-thousandth by dividing the spaces between the lines by the eye.

The measuring screw being turned by the milled head friction piece prevents undue pressure being put on the machine by careless usage.

All this has but very little to do with drawing and is given in explanation of the sketches made so long ago.

To avoid referring to a back number an enlarged view of the machine, as given in Fig. 39, is here reproduced.

In a large number of the apprentices' specimens of drawings of this machine that have been sent me for correction and criticism, I notice what I have noticed many times before, and that is a disposition to make the title quite as conspicuous as the drawing itself. As such drawings are to be seen at a distance of not more than a foot or two, lettering that can be read at that distance is large enough for a title.

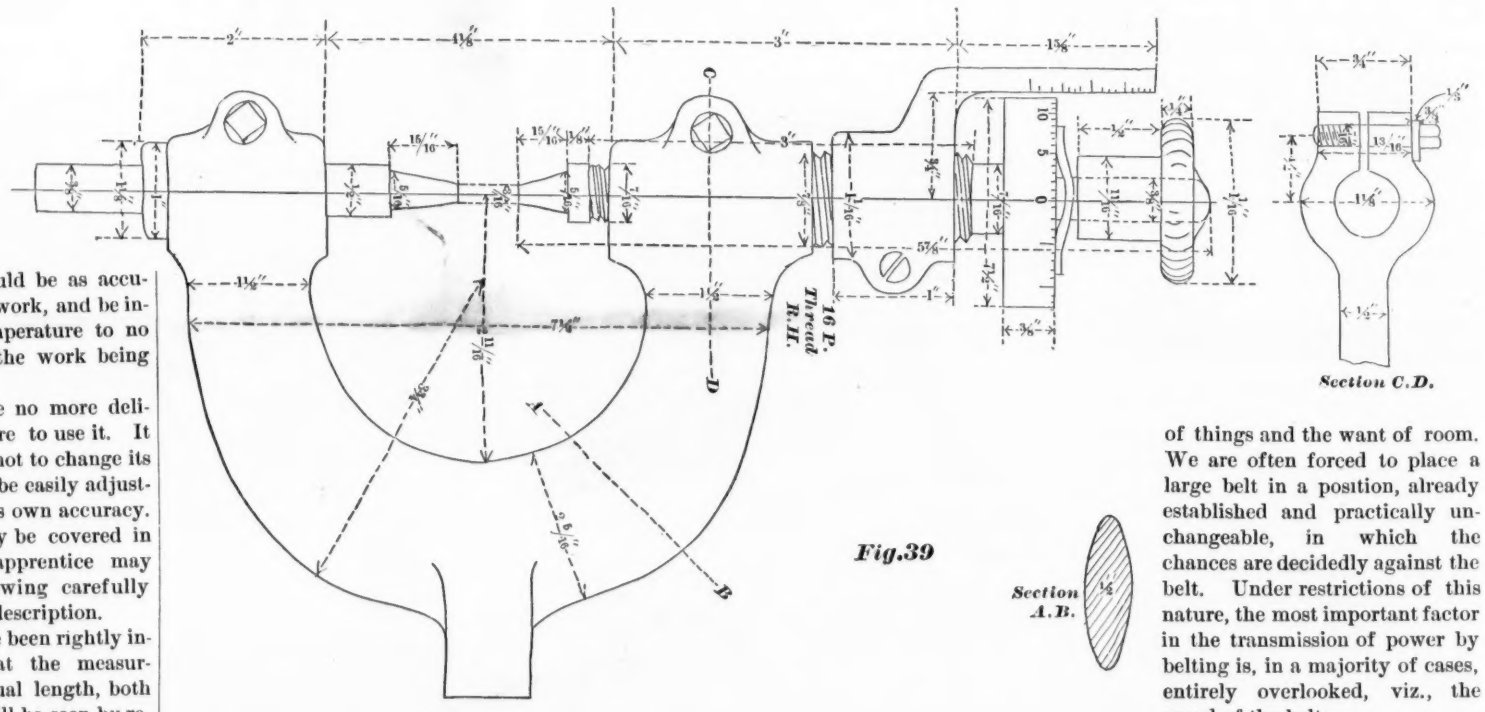


Fig.39

Belts.

SECOND PAPER.

BY CHARLES A. HAGUE.

In the use of belting for driving machinery, there are encountered in every day practice innumerable difficulties and conditions not taken into account in the ordinary consideration of the belt subject. Among the small belts, say from 3″ to 6″ wide, we will find many instances wherein, by reason of slow speed or small pulleys, an excessive strain is necessary upon the belt and lacings in the endeavor to perform a desirable amount of work. The belts are laced and relaced from day to day, are worn out or mutilated so as to be replaced two or three times a year, and still the infliction goes on and comes to be considered a necessary evil. These annoyances are of course enhanced frequently by the lack of wisdom and care upon the part of attendants, whose duty it is to look after such things, but proprietors are sometimes quite unreasonable in expecting the class of laborers usually employed for such purposes, to possess that interest and knowledge so necessary in adapting means to an end to the best advantage. It would be an agreeable surprise to most unprejudiced persons interested in this matter to observe the difference between the hard-pulling every-other-day breakage of a belt, under adverse conditions, and the swift-running, easy-going article spinning along for half a year without trouble, and perhaps not the least of the pleasure would arise from the contemplation of the insignificant changes necessary to produce the result.

The expense incident to the placing of belting under proper conditions for economical service and long life, also to rendering it in a very great measure independent of the assistance of incompetent attendants, cuts a very small figure compared to the steady drain upon the profits, resulting from ill arranged and overloaded belts.

All belting 8″ and under in width can, and should be arranged to drive the load at a tension light enough to enable a person accustomed to machinery to throw a belt on the running pulley by hand.

Passing from the smaller to the larger belts, we are again confronted by adverse surroundings. With wide principal driving belts the conditions are apt to be more arbitrary, simply on account of the magnitude of things and the want of room. We are often forced to place a large belt in a position, already established and practically unchangeable, in which the chances are decidedly against the belt. Under restrictions of this nature, the most important factor in the transmission of power by belting is, in a majority of cases, entirely overlooked, viz., the speed of the belt.

There are many cases in practice wherein a little attention to this point at the beginning would have opened the belt-maker's eyes in time, and saved much trouble and expense. I am very much inclined to believe—as was intimated in a previous article upon this subject—that belting is sold and placed largely upon the strength of guesswork and luck. Considerable wonder is indulged in that some belts of just the same quality of stock and just as well made as others should not wear half as long.

Although seemingly unavoidable in a great many cases, on account of the lay-out of buildings already in use, I must say a word against the damaging use of idlers or tighteners placed upon the backs of main driving belts. There are some instances in which the idler simply holds the slack of the belt steady, and, aside from a slight additional wear upon the outside surface of the belt, does no harm; but there are many examples where the belt is decidedly unable to drive the load at a pressure upon the pulleys due to the steady weight of the belt alone. And as power is merely the product of force or resistance multiplied by motion, and as we must obtain a certain power at all hazards, whatever is lacking in speed of motion must be made up in weight of pressure. The production of pressure upon the pulleys by straining down upon the slack of the belt, is equivalent to an increased strain lengthwise of the belt, and when

this strain is carried beyond the elastic limits of the belt substance, it is a question of but a comparatively short time before the joints and the substance itself begin to give out. This point once reached, the destruction of the belt is very rapid.

Nor is this all, for the increased pressure is felt by the journals, and some of the equivalent of power becomes sensible in heat, causing the application of an increased quantity of oil. The heat indicates loss of power, while the surplus oil is not only lost, but is mostly thrown upon the belt, and hastens its already assured destruction.

It seems as though it would be a good plan for belt manufacturers to take a trip around to numerous factories, indicate the engine for power, and observe the conditions and probable pressure under which the large belts are operated. Thereby would be established some rational standard of performance for their guidance in such matters. They would soon discover that engines reputed to be driving enormous loads were having quite an easy time of it, and consequently the work being done by the belt had been wildly guessed at. They would probably find instances like one I noticed, where a certain width of belt was driving a certain load at a speed of about 4,500 feet per minute; while another belt of the same width and weight, was struggling along at 3,000 feet, with a greatly increased pressure and doing less work.

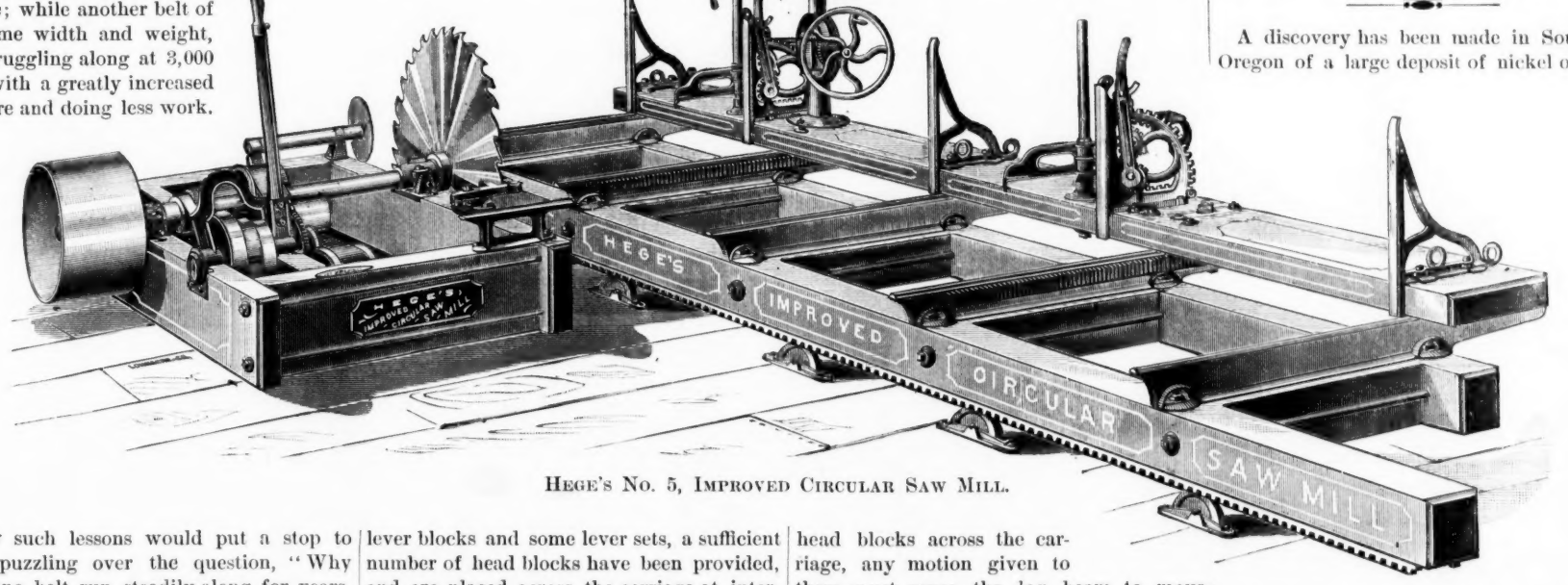
A few such lessons would put a stop to their puzzling over the question, "Why does one belt run steadily along for years, while another one just like it goes all to pieces in a comparatively short time?"

In conclusion, I would remark that in the practical operation of belting there is quite a distinction between light narrow belts and wide heavy ones. As will be seen by inspecting the table in the previous article, a higher resistance is given per square inch of contact for the narrower belts, which was in part explained, but the following may set the matter in a still clearer light: It may be possible to strain the large belts nearly up to the unit of pressure of the small ones, but when a large belt stretches a little and becomes slack it would fall short of the driving power calculated on, and unless the belt was tightened it would slip, and in a very short time work a great deal of damage. To throw off and relace a small or medium-sized belt is not much of a job, but to shorten up a wide heavy one, especially if made endless, is quite another thing, and should be avoided as much as possible; therefore, it is cheaper to give the large belt sufficient capacity to drive when quite slack as compared with a small one.

Hege's Improved Circular Saw Mill.

The engravings presented herewith represent a circular saw mill, with some of its principal details. It was designed by C. A. Hege, and is made at the Salem Iron Works, Salem, N. C. The circular saw mill is fast replacing the old-fashioned upright saw, that being entirely too slow for the times. One of the chief reasons for its having remained in use so long has been its reliability, whereas, until within a few years, circular saws have been unable to produce a true and smooth quality of lumber. With present improvements, the quality of work produced by circular saws is not only truer and smoother, but the quantity is far in advance of any other style of saw mill.

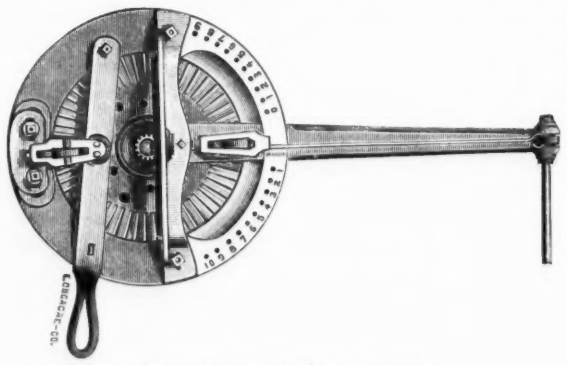
The mill here shown has a universal log beam, rectilinear simultaneous set works, double eccentric friction feed, and improved crank attachment to throw back the log beam. The arrangement of the log beam will be understood from the engraving, where it will be observed that, instead of having two or more head blocks, with uprights acting independent or simultaneously, as with screw lever blocks and some lever sets, a sufficient number of head blocks have been provided, and are placed across the carriage at intervals of four or five feet throughout its entire length. Upon these is a long bar or slide of wood, to which are rigidly fastened the cast-iron uprights or knees, for the log to rest against.



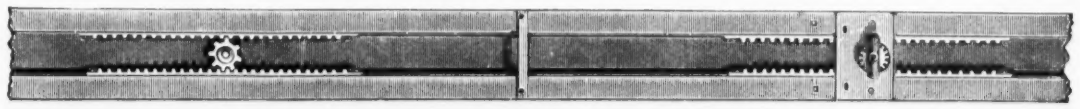
Hege's No. 5, Improved Circular Saw Mill.

Two or more of the head blocks, at suitable distances from each other, are provided with racks extending their entire length on one side, as shown in the engraving, being the second block from each end of the carriage. In the under side of the wooden slide or log beam is a groove running its entire length. In this groove are arranged racks on each side, and so placed that when the log beam is about the middle of the carriage the center of each set of racks will be directly over the racks on the head blocks previously mentioned. This will be better understood from the engraving, in which these longitudinal racks are shown connected by wrought-iron bars. The double pinions are also shown, with one end of each gearing in the racks. When in position upon the carriage, the other ends gear into the racks shown on the side of head blocks.

The racks are connected on one side of the groove by the wrought-iron bars, so that as one rack is pulled endwise the other rack on the same side must move exactly an equal distance. The two racks on the other side of the groove are connected in the same way.



Top View of Dial Plate.



Under Side of Log Beam.

Front View of Circular Indicator.

In one of the pinions is secured one end of a shaft which extends upward through the log beam and through the support to the top of dial plate where the end is secured to a ratchet wheel. This ratchet wheel may be turned in either direction by the lever and pawls thus transmitting motion to the pinion below. The pinion in the log beam, by means of the racks in the groove, moves the other pinion in the same direction and an equal distance with itself.

The pinions gearing into the racks on one side of the head blocks across the carriage, any motion given to them must cause the log beam to move across the carriage. Both ends are compelled to move at the same instant, and an equal distance with each other, it being impossible to spring a bar of iron by a tensile strain not exceeding its elastic limit. There are eight cogs on each pinion, while on the racks across the carriage there is one cog to each inch. By turning the ratchet wheel one-eighth of a revolution the log beam will be moved one inch precisely. The dial plate, as will be seen from the engraving, is graduated and arranged with holes for stops or pins so that the ratchet-wheel may be moved any desired distance varying from one sixty-fourth of a revolution to one-quarter of a revolution by one stroke of the lever, which will move the log beam from one-eighth inch to two inches.

When the stops are set for any particular thickness of lumber and the lever is moved the full distance between the stops it will always move the log beam an equal distance. The lever that actuates the ratchet-wheel is within easy reach of the sawyer even with a large log upon the carriage. From this description the reader will observe that the log while being sawed is supported every few feet and is firmly held by self-adjusting dogs, therefore springing is impossible. With this arrangement the sawyer can easily accomplish all the details of setting without leaving his place.

The enlarged front view of circular indicator shows the pointer-wheel on top of dial plate, also arrangement of levers, pawls and stop pins. In the top view of dial plate the holes are shown numbered both ways from the center; each of these numbers represents an eighth inch. This engraving also shows the beveled pinion, which moves the pointer wheel in the circular indicator.

There were 90 locomotives exported from the United States last year, valued at $893,123. Brazil took 15; Quebec, Ontario, Manitoba and the N. W. T. took 18; British Columbia, 1; British Possessions in Australasia, 30; Hawaiian Islands, 2; Mexico, 19; Spain, 3; Cuba, 5; Porto Rico, 1; U. S. Columbia, 4, and Uruguay, 1.

It has been noticed that copper, when melted with salt, and subsequently cooled, is much tougher than ordinary copper, this being due, in all probability, to the removal of the cupreous oxide which is generally present in greater or less quantities.

No less than 800,000 tons of tin plate are annually used in the United States in the manufacture of tin boxes and cans for oysters, and the multitude of various things known to canners. A single New York firm uses twenty tons of tin plate per day.

A discovery has been made in Southern Oregon of a large deposit of nickel ore, resembling that discovered in New Caledonia in 1864, the development of which, by the French, has so greatly extended the economical use of this metal.

The annual yield of the American forests is $150,000,000 in raw material. The industry gives employment to a large army of men.

Canada subscribers often write to ask us if Canada money will be as good to send us as United States currency. We answer yes. We will take all the Canada money sent us for subscriptions by Canada subscribers, just the same as United States currency.

The Pennsylvania Railroad Company has just tested, with satisfactory results, a system of electric lighting for passenger coaches by means of a Faure accumulator. A passenger car provided with seven lamps of two burners each was attached to a regular train from Jersey City to Philadelphia, and a number of railroad officials and electricians made the trip. It was the unanimous opinion that the experiment was an entire success. The lamps gave soft, clear and steady light. The accumulator, which was placed under the middle of the car, transmitted electricity to the carbons by wires on either side. Dr. Dudley, chemist of the Pennsylvania Company, conducted the experiment.

More Inertia for Machine Shops.

By Oberlin Smith.

The above title is not intended to imply that the aggregate quantity of the sometimes desirable article, inertia, is at a minimum in the average machine shop. It may be found in abundance standing in two shoes, or sitting on three-legged stools waiting, Micawber-like, for something to turn up—the "something" being perhaps a piece of soft iron with a surface speed of eight or ten feet per minute, and the turning-up being done with a cut a sixty fourth inch deep, and a feed of eighty to the inch. The race of lazy apprentice boys, of conscientious young much-afraids under instruction (?) and of owl-eyed old wiseacres in spectacles, all of whom take such tender care that our machine tools do not strain themselves by overexertion, is a well known one; their inertia is inherent, but is perhaps too often aided and abetted by the lack of that quality in the tools themselves. The age of "scratch-cuts" will not be past while our lathes scare their operators from all thoughts of good commercially-paying metal cutting, by trembling in every limb and member when approached with a tool-edge.

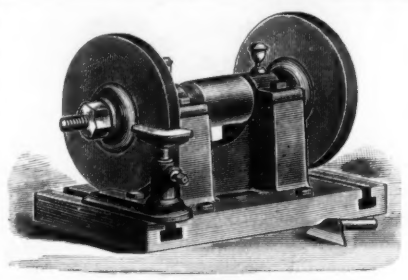
The designers of our machine tools all seem to have worked more or less upon the general principle (an excellent one in many constructions) of so arranging the metal as to guard against breakage and serious deflection in every part. Some of them produce an artistic and well-proportioned machine, with just enough metal everywhere to meet, without breaking, all strains that it may be subject to. Another kind (happily they are dying off) add considerable metal to these ideal proportions for the sake of heraldic and architectural ornament, as shields, pillars, mouldings, plinths, tracery, etc.

These atrocities really improve the machine somewhat in respect to inertia, but the damage to artistic culture among our machinists is terrible to contemplate.

A third class are the designers of our really first-rate tools, who besides making a strong and comely machine actually put in a quantity of the surplus metal, the inertia of which is so necessary to prevent jarring and trembling. They do not, however, carry this idea far enough. They do not embody in their machines nearly enough of what we may term the "*anvil* principle"—the supplying of a dead mass of heavy material to absorb vibrations and to stop, by its inertia, motions foreign to the functions of the machine. Many of our lathes and planers seem to be built upon what, for want of a better name, we may call the "*fiddle* principle." In that exquisite instrument every care is taken to increase and develope its vibrations, and yet everything is strong enough to resist breakage—at any rate all the non-feline parts. If we imagine the result of mounting the bridges and strings of a violin upon a marble door-step, we begin to conceive what we ought to do with a chattering lathe mandrel.

The principle for general construction, before referred to, of putting in each part just the proportion of material for requisite strength, is absolutely essential for certain classes of engineering work; for instance, in the superstructure of suspension bridges, and in the rigging of ships, where every pound of dead weight is an element of self-destruction. Or, for another instance, take machines of locomotion, as boats, railway engines, carriages, mowing machines, and the like. In these dead weight is forbidden for reasons of economy in maintenance and use.

In almost all other kinds of machinery (excepting machine tools) this principle need be regarded only as far as the *moving* parts are concerned. The frame and all non-moving parts may with advantage be as heavy as the



Emery Grinder.

pocket of the owner will allow. Moving members should of course be as light as their functions will permit, to lessen friction; but on those which have rapid motions, especially if of a reciprocal nature, most particular care and study should be lavished, in order to reduce both friction and vibration. Prominent instances of this latter idea may be seen in many kinds of textile machinery as well as in agricultural and wood-working apparatus.

In machine tools the necessity for such construction applies scarcely at all. We must have in these tools slow speeds, considerable strength and great accuracy of motion. The first allows a heavy style of construction; the last two demand it. The percentage of power required to overcome the friction caused by extra pressure of heavy members and greater speed of large journals is small, and on such slow running machines as those in question, is not worth counting, against the advantages gained. The first cost of extra material (mostly cast iron) is a very economical expenditure when we obtain a greater capacity for production, daily and hourly, for a score or more of years.

From the foregoing we deduce that almost any machine tool would be better and, in the long run, cheaper, if it were built very much heavier than is the present practice. Not to specify any exact amount, perhaps for a general average, about one hundred per cent. heavier than the best tools now made would be a reasonable figure. In some cases the frames and other stationary parts could with advantage be increased even more than this. The moving parts will admit of various degrees of "clumsiness," according to their position and functions. One limitation is of course getting the necessary room without interference with contiguous parts. Another is in avoiding too great friction and inertia in parts which must frequently be moved by hand—as lathe carriages and like constructions. Within the limits thus imposed, there is no reason why such rotary tools as lathes, boring-mills, drill-presses and milling machines, should not be greatly increased in weight.

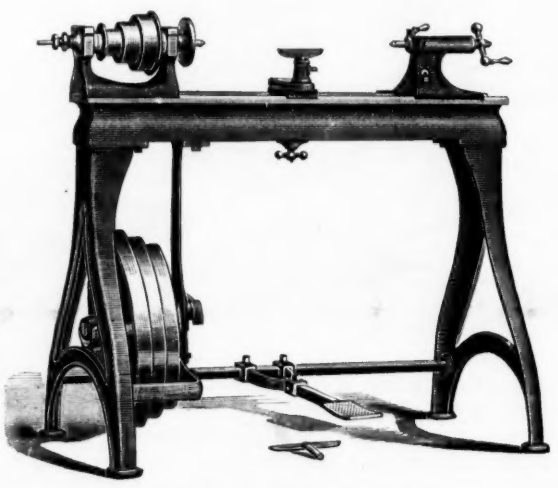
With such machines as planers, shapers and slotters, another limitation comes in; the reciprocating parts must not have inertia enough to cause serious jerking at the times of reversal. With the latter two machines this is not much of a difficulty, as they are usually driven by cranks, and there is consequently no sudden stopping or starting. With planers, however, this point should be carefully looked after, and the tables kept lighter than would really be best for them were their motions of a smoother character.

In nearing the conclusion of this article, the writer wishes to disclaim any intention of trying to "bull" the pig iron market; also any collusion with freight companies who carry machinery by the pound. He yet sincerely hopes he may contribute his mite toward influencing a reform in designing that noble class of machines which are at the fountain-head of all other machinery, and whose faults and merits are duplicated in their offspring a thousand-fold.

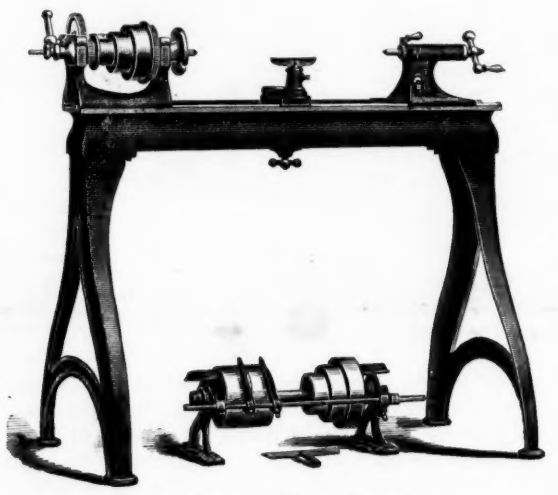
To mention a bit of practical experience, the writer has recently built some special twenty-inch lathes for his own use which, though very short (only admitting 12″ between centers), weigh nearly 3,000 pounds, and have a front spindle bearing three and a quarter inches in diameter. Though giving results in the way of smooth and heavy cutting far beyond any ordinary lathes in the shop, he would another time, try for a little more of a good thing by having yet additional metal. An interesting question for the future is, who among our machine-tool makers will be the first to produce a short twenty-inch lathe weighing 5,000 or 6,000 pounds, and having a front spindle bearing not less than five inches in diameter? A still more interesting question is, who among our machine-shop owners will be sensible enough (and rich enough) to buy such a lathe?

Improved Foot Lathes and Emery Grinder.

The two hand lathes represented by engravings on this page are made from entirely new patterns by W. C. Young & Co., Worcester, Mass. The head spindle is hollow and has large bearings and the step screw is made the full size of the back bearing to give a solid step for drilling. There are cones for three changes of speed on each lathe, and the back gear gives one revolution of the spindle to five of the cone. The treadle of the foot power is made to slide on the square rocker shaft so that it can be brought directly under the foot of the operator at any point desired where it can be securely fastened by set screws. The connection between the treadle and crank is so arranged that if the foot of the operator should come under the treadle while in motion the crank is instantly disconnected, removing all danger of accident from this cause.



Foot Power Hand Lathe.



Back-Geared Hand Lathe.

The balance wheel is hung on swivel bearings which brings them always in line with each other. The crank is adjustable and balanced to secure steadiness of motion. Attached to the back of each lathe is an iron tool shelf twelve inches long.

The emery grinder shown by cut, which is also made by the same firm, has a $1\frac{1}{8}$″ steel spindle running in babbitt metal bearings having U shaped grooves cast in them to prevent end motion. It is calculated to carry two ten inch wheels with 2″ face and $\frac{3}{4}$″ hole. The rests are held in T slots in the base of the machine. These extend through so the rests can be used on either side of the wheels.

Science is often used to aid deception. The *Springfield Republican* says a mill is to be established in Holyoke, Mass., for the manufacture of imitation sealskin. The men who are to start the business came over from England. They expect to invest $100,000, and to employ 100 skilled hands, whom they will bring with them. "The machinery is now on its way from Europe, and the manufactory will be in running order in November. The Chadwicks have been engaged in this business for years, and the material resembles the genuine article so closely that good judges are puzzled to detect the difference." This seems to be the era of wholesale deception.

Vacuum.

[From the Mechanical World.]

Any one who has had much experience in the indication of engines will have noticed how assiduous the attendant—particularly an old hand—becomes with the spanner or screw-key, tightening up the glands and stuffing-boxes of his engine, and making all steam-tight and air-tight as soon as he catches sight of the indicator. He will very often, too, be seen to give a fresh supply of tallow or other lubricating material to his pistons and valves; but, above everything else, he will be careful to see that no joint or stuffing-box in connection with any part of his condensing cylinder is likely to be drawing air; and he will further, if possible, increase the supply of injection or condensing water going to the engine.

The object of all this is to get as good an indication as possible on the indicator card, as well as of what is known as "vacuum," in the condenser. On the degree of perfection reached in this, most enginemen particularly pride themselves; none better understand its value and importance. Indeed, it would be well if many so-called engine experts and inspectors, as well as steam users generally were more alive to the great importance of this "vacuum." Almost everybody is aware of the advantage of reducing as much as possible the "back-pressure" upon an engine piston; and the securing of a good "vacuum" really means the diminution, as far as possible, of the "back-pressure," or reducing to a minimum the resistances opposing the piston's motion.

If we consider for a moment the saving effected in a large engine by the improvement of only a single pound in the effect of the vacuum in the condensing cylinder, we shall probably be surprised at what such a saving really represents in actual money value. Take the case of an ordinary compound engine, say, with high and low-pressure cylinders of 22in. and 44in. diameter respectively, 6ft. stroke, and running 50 revolutions per minute; such an engine as we commonly find in our large cotton mills. We shall find the "constant" for the low-pressure cylinder of such an engine to be about $27\frac{1}{2}$; that is to say, for every 1lb. average pressure on the low-pressure piston a duty will be given out equal to $27\frac{1}{2}$ indicated horse power. It will frequently happen that the maximum effect of the vacuum obtained will not exceed $9\frac{1}{2}$lbs, and we have on many occasions seen it improved by very slight alterations and attention to air tightness, etc., to $11\frac{1}{2}$lbs. This improvement alone, with an engine of the above dimensions, would represent, therefore, a clear gain of something like 55 indicated horse power.

Now let us "figger" once more. Assume the engine to be burning, say 3lbs. of coal per indicated horse power per hour, and to be working ordinary mill hours—that is to say, 56 hours per week; multiplying, we get 55 I.H.P. × 3lbs. = 165lbs. of coal per hour = 9,240lbs. (or, say, something over 4 tons) of coal per week, which, with fuel at 7s. 6d. per ton, really represents a saving in actual money value of something like 30s per week by an improvement of 2lbs. in the vacuum alone. This is not by any means an exagger-

ated case, because it will be found, on reference to statistics published from time to time by the different boiler inspection companies, that the average effect of the vacuum obtained on a large number of engines is very much less than it ought to be. Thus we see that the great concern shown by a good attendant for the effect of the vacuum on his engine is not so uncalled for as might at first sight be supposed, and by his carelessness or diligence in the matter of looking after his stuffing boxes and joints, and the air-tightness of his condensing apparatus generally, and all its adjuncts, a saving or loss may result to his employer amounting to a large proportion of his own wages. Indeed, we believe, that the mere fact of placing engines under independent supervision and indication, often far more than repays the annual amount of subscription by the increased care and attention paid to their working by those in charge. We believe the importance of very carefully looking after the vacuum is much more generally recognized, especially by manufacturers, than it was some years ago, and, from the inquiries which have appeared from time to time in our query columns, it would appear that information respecting the causes of bad vacuum is some thing which is very greatly wanted.

The causes, however, which lead to impairment of the vacuum are so numerous and varied that it would take too much space in the present article to attempt to treat them fully. We have been applied to for information on this subject by firms who appeared to have exhausted every resource in trying to get at the cause of their high back-pressure, but ineffectually; and in such cases we have generally suggested that they should place the matter in the hands of some well-known expert most of whom have had so much experience that after indicating and looking round they are able to point out the cause at once, and thus save much expense in experimenting. The matter is of much importance, and we have known many instances where unnecessary outlay has been incurred by firms in changing side pipes, valve boxes, etc., and in making other alterations which might have been avoided.

An Example of Western "Shopitecture."

Much has been said and published about the substantial, convenient and frequently ornamental construction of Eastern machine shops. "Shopitecture" (as designated by Chordal), or the planning and building of shops, is an important branch of the science of mechanics. Eastern machinists are generally led to think that this branch is woefully neglected "out West." The object of our presenting an external view of the new shops just erected by Dean Bros. Steam Pump Works, of Indianapolis, is to show our readers in the East that "Shopitecture" so far from being neglected in the West, is being carried forward to a degree, in the example here selected, at least worthy of imitation by most establishments in the older portions of our country. The engraving, it will be noticed, represents a pleasing exterior to the building, something which seems to have been regarded as of very little consequence by many parties who have built machine shops, if we may take the results as expressing the views of the designers. It requires no argument to show that almost any machinist will be better pleased to work in a shop having an attractive exterior and cheerful surroundings, than in one having a repulsive appearance. Everything that tends to make it more pleasant for the men who do the work will benefit the proprietors in the general results. It may cost somewhat more to erect such shops, but the investment will usually pay a handsome profit.

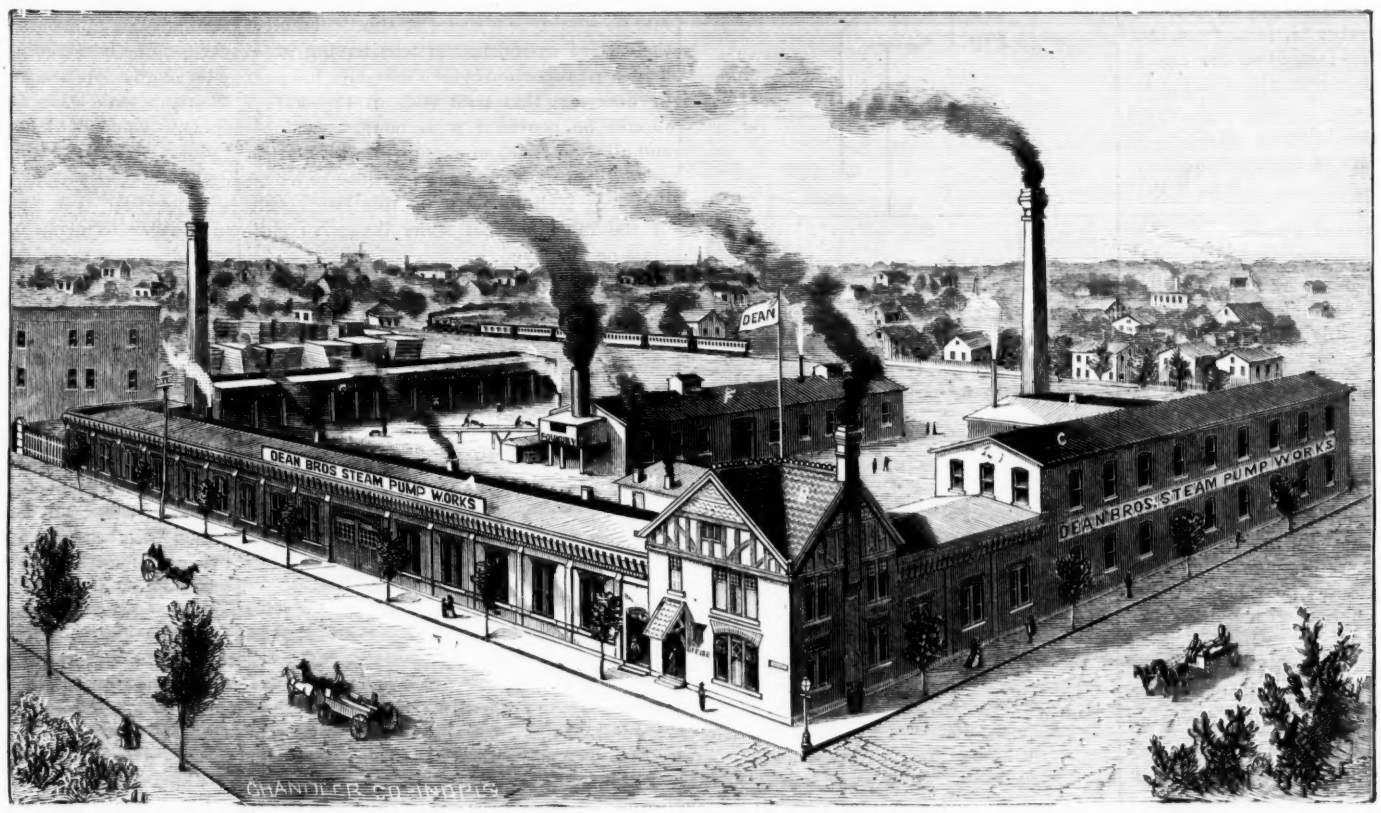
The building marked *A* fronts on Madison avenue, and is used as a machine shop. It is 50 feet × 200 feet, is built of red brick, ornamented with black brick and cut-stone trimmings. The arches are of cut, pressed brick. Inside there is an overhead traveling crane, running the entire length of shop, capable of lifting five tons. On the floor is a tramway extending along the center of shop, provided with cars for moving castings and machinery from one end of shop to the other; there is a turntable and track leading into foundry. At the farther end of this shop is the apparatus for testing pumps with steam and water before shipping. The lower story of building marked *C* is also used as a machine shop; it is 40 feet × 130 feet. The upper story of this building is used for the pattern shop. The offices are in the corner building marked *B*. This is of red brick; the roof is covered with red Ohio tile, with cresting of same material. The gables are finished in the upper part with ornamental red tile, and lower part "half timbered" with plaster panels. The windows have upper sash of stained glass and lower sash of plate glass. Inside, the office is finished in black walnut. The floor of the public office is laid with red and buff tile.

There is a large fire-proof vault, lavatory and private office. The second story has a large drafting room, with north and east light. There is also a room for mailing and storing catalogues, circulars and other printed matter.

The engine-room is in wing *E*.

The foundry, marked *F*, is in the rear. Here all the casting is done for the establishment. The moulding-room is 40 feet × 80 feet, and is fitted up especially for making steam-pump castings. In the rear of the foundry is a storehouse *G*, where flasks, patterns and foundry supplies are kept.

The building *H* behind the office is the blacksmith shop.



New Shops of Dean Bros. Steam Pump Works.

Figures in the *Railway Age* show that a greater number of miles of railway has been constructed during August than ever before in a similar period in the history of the country. The total is 1,274 miles of new main track, exclusive of side tracks laid on seventy different lines, exceeding by more than 300 miles the construction during July, which, it was thought, would not be again equaled. The construction for eight months of the present year on 238 lines in thirty-two States has been 7,048 miles of main tracks. The construction for the entire year is estimated at 10,500 miles, the largest number of miles being 207 in Iowa, the next, 153 in New York, and the third 142 in Wisconsin.

A new pump for compressing gases to a high degree has just been invented by M. Cailletet. Hertofore there has been a useless space between the end of the piston plunger and the valve, which closes the end of the cylinder. This is obviated by inverting the cylinder and covering the end with a quantity of mercury. A liquid piston is thus formed which can adapt itself to every inequality of form of the interior space, and which sweeps up every portion of the gas, pressing it up a conical passage into the valve.

LETTERS FROM PRACTICAL MEN.

Lightning Machinists.

Editor American Machinist:

I have no doubt Mr. Dynamicus, who seems to think a large proportion of his "fellow-chips" are entirely too slow, is a "lightning machinist." If your readers will look on page 133 of the book called "Extracts from Chordal's Letters," they will find an excellent portrait of a machinist of that kind. He is represented in the very act of "jerking the shipper from side to side," just as Dynamicus would have us all do. At the same time, he is squirting oil everywhere except where it is needed with the other hand. Chordal says that this chap does not and cannot accomplish anything.

I would like to know if, when he instinctively looks to see if the tool stands, at a speed of 300 or 369 feet per minute, he finds that it does or does not stand; and, if he finds that it does, will he be so kind as to describe it in your columns? The best lathe or planer tools I have ever seen would stand at a speed of from 15 to 35 feet per minute, according to circumstances, and no faster, and, if they can be made to stand at a speed of 360 feet per minute, I would like to know how.

I should judge from the tone of Dynamicus' letter that his experience had been exclusively in the poorest shops of the country. If it had been otherwise I think he would have known that the majority of machinists do not try to see how little work they can do and do not set their calipers fourteen times, and see whether or not they dare try the fit of their work. I think the man who would like to see machinists work after the manner of the boys who paint barrels in cooper shops, has a very poor conception of the machinist's business. M.

Springfield, O.

What to Read.

Editor American Machinist:

I have noticed a number of inquiries in your paper concerning what to read. All such I would refer to an article by "Chordal," to be found in the American Machinist of June 19, 1880, which is one of the most sensible things I have ever seen written on that subject. F. E. Hudson.

Boston, Mass.

Slow Speeds and Coarse Feeds.

Editor American Machinist:

Concerning the cutting principle of tools, the inquiry whether it is best to run at a speed allowing a tool to preserve its edge, or to let it become dull quickly and spend more time at the grindstone, is the question. Nothing irritated Bodmer, the celebrated mechanical engineer, so much as to see a workman trying to rush work by running too quickly. Slow speed and coarse feed are what tell on heavy work. I once worked next to an advocate of fine feed and quick speed. I was cutting off some packing rings 17″ in diameter in the lathe with a cut-off tool, and the tool was cutting and clearing itself beautifully. "Fine Feed" told what a speed he used to run at when he was doing that job. I asked him if his tools did not come out blue, dull and soft. He replied, "every time." How did you do then, I asked. "I had lots of them," was the reply. Rather hard on the tool-dresser I should think, besides time lost in filing them. On another occasion he undertook to run or rush a slow speed man on some heavy cylinder heads. He ran on the lightning principle, two speeds faster than his rival, and used the single speed for the second cut: also bored the 4½″ hole on the single speed with a small tool and with numerous cuts. He danced around his lathe like a cooper round a cask, rushed to the grindstone and whipped (ground) a little off the extreme edge of his tools with the sweat pouring off his face in streams.

Slow speed man took it very coolly and appeared to be going to sleep. He used a large, stiff tool with a lip-cutting edge, and made the hole nearly the size at one cut with a slow speed and coarse feed. He also made up with his coarse feed and slow speed in turning and came out ahead, with the cutting edge of his tools in good order. "Fine Feed's" tools were in a horrible condition, having been ground in a misshapen manner.

The active, bustling man often makes false moves, and, although he appears to be working himself to death, he accomplishes but little. It is an old Scotch proverb that "the more hurry the less speed," and that "nothing should be done in a hurry, except catching fleas." The fact is the fly-about

man makes his heels do what his brains ought to do. Where I once went to work in a shop an old fellow came up and remonstrated with me for using such a coarse feed. "Good heavens!" he exclaimed, "this will never do. You will work yourself out of a job. Put on a quicker speed and a fine feed and it will look like doing more work. The bosses will think you are working like lightning." VETERAN.

Fort Wayne, Ind.

Engines of 12,000 Horse-Power.

Editor American Machinist:

I notice in a recent issue of your paper a question asking if ever there had been an engine of 12,000 horse-power. John Elder & Co., the largest shipbuilders on the Clyde, are at present building a steamer for the Guion Line. She is to be 550 feet long, and her engines are to be 12,000 horse-power. They expect 19 knots from her (that is, she is to average that speed between Liverpool and New York). ALEX. DARLING.

Sandyford, Glasgow, Scotland.

Double-Acting Iron Planers.

Editor American Machinist:

The undersigned "served his time" in a shop where there was a double-acting planer similar to the one spoken of by G. B. G. in your issue of September 2d, 1882, from 1858 to 1860, and therefore instead of the one in Lowell being an improvement on the common planer, it is simply going back about twenty-five years and bringing up afresh an almost forgotten piece of mechanism.

Denver, Col. WM. PIM.

An Electrical Theory.

Editor American Machinist:

In your issue of August 23, in answer to a question asking whether electricity streams up or down a lightning conductor, the answer is "down."

As there are several theories of the action of lightning conductors, I should like to offer what appears to me the most feasible theory, which asserts that the electricity streams up. The air, or clouds, become charged with electricity from several causes, such as the friction of wind against the earth, the evaporation of impure water, etc. This electricity is of two kinds, called positive and negative. Clouds charged with similar electricity repel each other, while those charged with dissimilar attract each other, until the tension or tendency of the electricities to unite becomes so great that the intervening air is unable to keep them apart, when they unite, producing at the same instant a flash of lightning.

It is a well-known fact that electricity cannot remain on a perfectly pointed body. Hence, if it were possible to insert a number of points into one of the clouds, the electricity of that cloud would pass quietly off by way of the points, combining with and neutralizing the dissimilar electricity of the other cloud, without producing either lightning or thunder. It is to perform this duty that lightning conductors are furnished with points. When a cloud charged with, say, positive electricity, approaches a lightning conductor, negative electricity from the earth passes off at the point of the conductor, combining with and neutralizing that of the cloud, thus protecting the object to which the conductor is attached.

When an object is struck by lightning, it is because there are no points about it from which electricity can pass from the earth with sufficient rapidity to produce electrical equilibrium of the air, whence they often combine with destructive violence.

Plainfield, N. J. PHILIP JACKSON.

Shop Practice in Balancing Pulleys.

Editor American Machinist:

I read with much interest the article in a late issue of the AMERICAN MACHINIST on the subject of balancing revolving bodies, by Mr. Hemenway.

This is a subject deserving much more attention than it usually gets in machine shops.

The straight edge, standing balance plan, serves for comparatively low speeds, but as Mr. H. has so well illustrated, is impracticable for high speeds. There is an aching void in machine shops for a machine expressly designed for this purpose.

The weighing device, also illustrated by Mr. Hemenway, seems to possess the desired qualities for arriving at a standing balance, and although the operation might be somewhat tedious, would give a fair running balance, if carefully carried out. But before the accuracy of the work can be tested, it must be subjected to the desired speed, and if found imperfect, the work of balancing should be continued.

I have long had in mind the plan for constructing a machine for this purpose, but have no time now to make it, nor inclination to experiment. However, if a suggestion or two on this subject should have the effect of bringing out something useful in this line, I will consider the time well spent in making them.

There are two important functions to be performed by such a machine: 1st, to determine the side on which the surplus weight is located; and, 2nd, to determine what

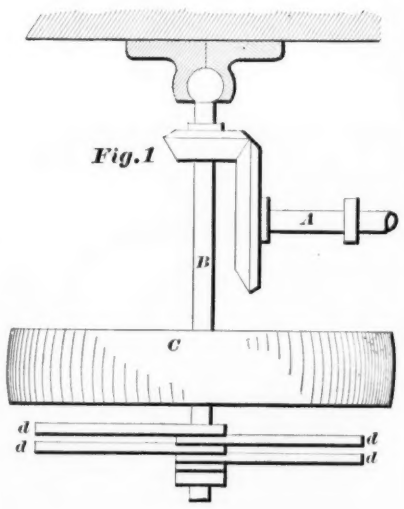


Fig. 1

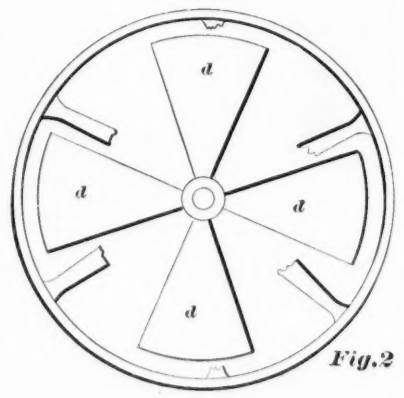


Fig. 2

amount of weight is to be applied as counterbalance. The elements necessary to this are found, I think, in the centrifugal hydro-extractors in common use in sugar refineries, laundries, woolen mills, and other like situations.

The method of balancing the contents of one of these machines is very simple, and yet very efficient; for, notwithstanding the contents may be many pounds heavier on one side than on the other, an equilibrium is found and established at once while the motion needed for the work is being acquired.

If a pulley or other article of machinery were to be placed in this hydro-cylinder, in a central position, and set revolving, any inequality in the weight of the rim would be at once corrected by the machine, and the motion, although many hundred revolutions per minute, would become as steady as though the pulley itself were perfectly balanced.

As the mechanism by which this is accomplished may not be generally understood, it may not be amiss to give a simple sketch of its essential parts.

Fig. 1 shows a side elevation of machine, *A* the driving shaft, and *B* a vertical shaft on which the pulley *C* takes the place of the basket on the ordinary machine.

The lower end of shaft *B* is without a stop or bearing, being entirely suspended by a ball joint at upper end, as shown. On this shaft at the lower end are placed a number of balancing pieces, *d*, *d*, *d*, *d*, fitting easily on the shaft, and having a fan-like shape, as seen in Fig. 2.

As soon as this central shaft is set in motion, these pieces *d*, *d*, *d*, *d*, also start revolving, but more slowly than the shaft, as they are not fastened to it. If by reason of any inequality in the weight of the contents of the basket, the shaft *B* is thrown out of plumb, the weights *d*, *d*, *d*, *d* at once find a position pointing toward the true center. They will continue to collect or concentrate on this, the light side, until by their weight and centrifugal force they have counteracted the uneven weight of the pulley or basket, and have drawn the shaft into a central position.

It will be plainly seen that if the pulley or contents of the basket is not out of balance, the weights *d*, *d*, *d*, *d* will be equally distributed around their common center, as seen in Fig. 2. But, on the contrary, if the pulley is out of balance to the extent of one of these weights, then their position would be as seen in Fig. 3. Two of the weights appear together at *D*, *d*. The operator would therefore soon learn by the relative position of these weights what amount of weight was needed to balance the article being tested.

These are only the outlines of the contemplated balancing machine. To further elaborate it, would be a waste of time. To meet the case of cylindrical articles having great length in proportion to their diameter, it would be necessary that both ends of the shaft *B* should be provided with counter-weights and allowed freedom enough on the shaft to cause them to assume any positions to which they may incline. It is on this last feature of the machine that some inventive skill must be displayed.

If any one has a better plan than this, let us have it. What we want is an efficient balancing machine. DYNAMICUS.

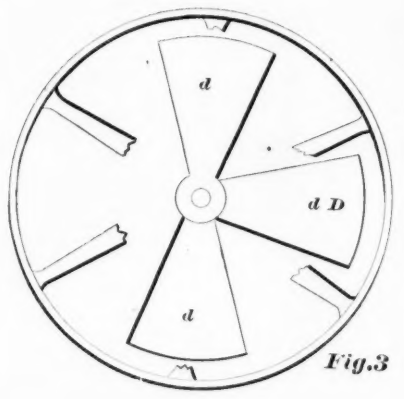


Fig. 3

Setting Up Engines.

Editor American Machinist:

There seems to be plenty of talk about the building and fitting of engines, but very little is said about erecting or setting up, which part I believe to be as essential, if not more so, than the building.

Commencing at the foundation, I will give my idea of a well erected engine, in hopes it will be beneficial to some young mechanic.

After having the hole dug for foundation, the bottom, if not of rocks or piles, should be spaded up loose and large stones thrown in—ragged-edged stones if you can get them; they sink into the dirt, and when pounded down with smaller stones and grouted with cement and water, make a much better base than usually formed of something taken out of the hole and concreted. The smooth surface of the concrete and smooth surface of the dirt coming together make it liable to slide. The size of the bottom of the foundation is generally designated by plans, but if it is not, for every one foot in height, increase size of base 6". This is the rule I follow, and I find it makes a base large enough. The main part of the foundation, also the part for outer bearing, should be tied together as high as you can tie them without interfering with the fly-wheel.

Next comes the setting of template, which, being made by some good carpenter according to drawing, and well braced, should have a center line drawn on it, holes laid out from the line and bored so bolts will fit tightly to prevent their moving. I generally set my template so its top represents the top of coping stone. That should be taken from the floor line. Make calculations for your belt and level your template every way. Next run a line at right angles to the shaft, or, if it be a new building, run it from the walls and have it so that when the shafting is up it will be square with the building. Then put in the foundation bolts, set them the right height above the template, level them one to the other, and set them plumb. If there be threads on each end it is best to jam the threads under the anchor plates, which will prevent their being screwed out of the nuts through any disturbance.

If setting an engine to be connected to a line shaft, it is best to allow for a raising of the engine—about ½" is plenty. Have the mason build a foundation so bolts will have at least ½" play all around. In order to do this, it is a good plan to put pipe over the bolts, long enough to come to the bottom of the stone or top of the brick-work. This prevents grout from running in and allows the bolts to be loose. Build the brick-work so as to have at least ¼" of vent between brick-work and stone. Next lay a thin strip across and put stone on; then put on the engine bed and outer bearing. If the shaft is less than 8" diameter put that in place; if more, it is best to run a line across through the pillow blocks and by that you can set the bearings approximately. Level your engine fore and aft and across *by raising the engine and stone together*, also level the shaft by using a V block, as it is the best thing to use on shaft. Run a line through the cylinder, centering at cylinder head end and stuffing gland hole, by pine sticks with a pin in one end. The pin allows of adjustment in length and a more delicate touch can be ascertained by sticks than by any other method, as calipering, for instance. If you have a balance crank it is not necessary to turn the shaft around, but if not, turn the shaft first on one center and then on the other, measuring to line to square the shaft and outer bearing. The measurements can be made the same at both centers by shifting outer bearing. Then put the cap on the outer bearing and screw it down firmly, which will bring it up to the shaft. If it has a tendency to twist or bear to one side grout the whole down firmly, using cement on the stone and sulphur on the engine bed and bolts. After it is well hardened, screw down on foundation bolts firmly.

We now come to the shaft, which must be taken in and out (using red lead to mark the bearing) and scraped, until it has a good bearing. This is very essential, as it enables the engine to start up without heating; and that there may be no delay about putting on the load, the level should be tried on the shaft to see that it is kept level in scraping. The eccentrics and fly-wheel next claim attention. Care should be taken, in putting the engine together, that all burrs are filed off, and that oil be used on every connection. The lining up of guides and the setting of valves depend entirely on the judgment of the "setting up" man.

The next important point is "hanging the rod." First firmly key it up at the cross-head end, and see that it will go in the brasses on the crank pin without springing; if it will not, the cross-head brasses must be scraped in such a way as to throw the rod over in proper position. Then put the cross-head near or at center of stroke; move the rod up and down, seeing that it travels parallel with the crank; if it does not, one guide should be lowered and the other raised in such a way as to make it travel parallel. If it is not advisable to move guides, scraping must be resorted to again. Next key it up at the crank-pin end, and notice if it will drop in the cross head brasses without springing. If it inclines to one side on both centers, the brasses want scraping; if it crosses the brasses, the pin is out. If the pin is found to be out, a good way to put it right is to use a good, sensitive level, and see that the pin corresponds with the shaft at the four points of the circle; if not, it can be either ground in with emery or scraped by using red lead and thrown in proper position. As it takes very little

variation in brasses or pin to make considerable in the length of the rod, great care must be taken.

In starting up the engine, remove the cylinder head and set the valves so as to blow out the dirt. Rap the pipes to knock off all scale, and blow through thoroughly. When oiled up, you are ready.

In setting up, it is best to chamfer sharp corners, and see that oil-holes are clear and oil-ways large enough; also look to clearance in the cylinder, and see that it is equalized. Turn the engine once around to see that all is right; then let her go.

Brooklyn, N. Y. Y. E.

Puzzling Indicator Diagrams Explained.

Editor American Machinist:

Referring to the "puzzling indicator diagram," described by "S. D." in your issue of September 23d. it seems to me most likely that a particle of sand or dust had got between the piston and the surface of the cylinder of the indicator with which the diagram was taken, and imbedded in the piston so as to cause a degree of friction not to be overcome without a certain degree of steam pressure. Driven up rapidly, when steam admitted at the opening port had reached that degree, to a point a little above that to which mere pressure without *vis viva* would have carried, it seems to have been arrested by friction until the pressure again accumulated sufficiently to give it another impulse, which again carried it above the pressure—now full initial pressure—where it remained until the reduced pressure near the end of the stroke permitted it to fall, though, I admit, without the suddenness to be expected when such friction exists. It appears as if the frictional obstruction were gradually diminishing; but the fact that "all diagrams taken from the forward engine compared with the one here shown," is inconsistent with the theory of *diminishing* friction, if the similarity was in degree as well as in kind of abnormal action.

If all the diagrams were taken with one indicator, my remarks are inapplicable.

Boston, Mass. J. C. Hoadley.

Henry R. Towne of Stamford, Conn., writes to the *Iron Age* from Ragatz, Switzerland, Aug. 18th, in reference to the death of Robert Briggs, the news of which had just reached him. The letter is as follows:

I have just received the sad intelligence of the death of Robert Briggs, the eminent civil and mechanical engineer, and, as an old and intimate friend, wish to add my share to the tribute of admiration and respect which his memory is sure to call forth from all members of the profession who had the pleasure and advantage of his acquaintance.

My own friendship with him covers a period of more than 16 years. It commenced with a trip to Europe in his companionship, during which we visited together nearly all the most important engineering establishments in England, Belgium and a part of France, and met many of the most noted engineers and scientists in the places we visited. From the intimacy thus begun, and which has continued unbroken until now, I can testify to the many high qualities of mind and heart which he possessed, and to the high professional position accorded to him both at home and abroad by those conversant with his abilities and with the products of his mind and pen.

One of his most notable traits was the comprehensive scope of his knowledge, which covered almost the entire field of engineering, both civil and mechanical, and included much also of metallurgy, chemistry, architecture and applied sciences. On almost any topic under these many heads he could discourse as a master, with a minuteness and familiarity astonishing to any one but those who knew what an extraordinary range was covered by his own personal experiences in connection with mechanical and industrial operations, and who knew also how far these were supplemented by professional study and reading, continued uninterruptedly during the 40 years of his business life. Added to these were the advantages of a good early education, an exceptional aptitude for mathematics (in which he excelled) and a very retentive memory. *Apropos* of the latter, I recall that during our English trip we made occasional digressions to visit noted historical places, and that at such times he was as full of facts and figures relating to the scenes we were visiting as a student of history, while his knowledge of architecture contributed further to the interest of his conversation. He was an omniverous reader, enjoying much even of the lighter literature, and a conversationalist of rare ability. His temperament was placid and equable, and his companionship a pleasure which his intimate friends, at least, can never forget. Among the latter are included many of our most prominent engineers and scientists, and not a few of those of England.

During all his life Mr. Briggs was a consistent writer on professional topics. Many valuable papers from his pen are scattered through the engineering literature of the past twenty-five years, which it is greatly to be hoped may yet be brought together in one volume. A still larger amount, doubtless of equal value, exists in the form of unpublished manuscripts, studies, notes and records of practice. It is most earnestly to be hoped that measures will be taken to preserve these fruits of many years, and to put them in form available to other members of the profession which Mr. Briggs did so much to promote and in the ranks of which he stood so high.

On the writer his loss falls keenly as that of a dear and valued friend.

An exhibition of car couplings is to be held at Darlington, England, October 3 to 7, inclusive. If one in ten of the multitudinous couplings patented in the United States could be placed there on exhibition, the collection would be sufficient to give a headache to any railroad official desirous of inspecting them.

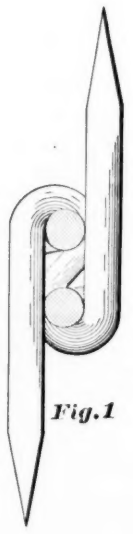


Fig. 1

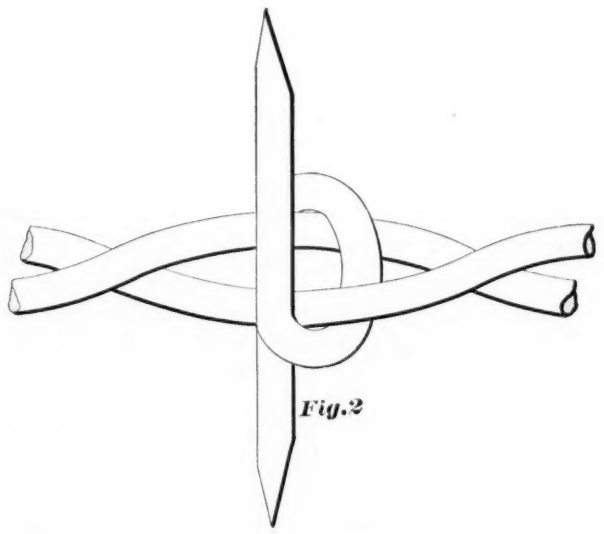


Fig. 2

Improved Two-Point Barbed Wire.

The accompanying engravings Figs. 1 and 2 represent a new and improved barbed wire, recently invented by J. D. Riggs, of Lawrence, Kansas. The objects of this invention are: To place a short two-point barb on double wire in such a manner as to leave it firmly attached, as shown in Fig. 1; to avoid unnecessarily short curves in forming the loops about the wires; to bind the two strands together without bending either at the point where the barb is attached; to fix the barb to the strands with a minimum of clasping pressure, and to overcome the resiliency of the wire barb.

The result is a very neat and light barb. It is successfully formed from one and three-fourths inches of wire, which is much less than the ordinary length required. As the bendings are not transverse to the direction of the cable, the injurious effects of resiliency are avoided, allowing the barb to remain firmly attached.

Henry E. Judkins, a conductor on the Maine Central Railroad, has invented an alarm signal for railway trains which would seem to be a great improvement on the present system. By his method a salt battery is placed in the locomotive cab, from which an insulated wire extends to the coaches, being coupled by an automatic coupler. In each coach are push knobs, by means of which any desired signal can be transmitted to the engineer through a gong in the cab. In the instance of the accidental breaking of the train, the engineer, conductor and trainsmen are notified by the operation of the signalling device. There seems no reason to doubt of the superiority of some such arrangement as this over the old unsatisfactory, and often inoperative bell-cord affair, or that its adoption would result in saving life and property.

At the raising of the vessel La Provence, sunk in the Bosphorus, the telephone was added to the ordinary equipment of the diver. One of the glasses of the helmet was replaced by a copper plate in which a telephone was inserted, and the diver had only to turn his head slightly in order to report what he had seen or to receive instructions.

A North Carolinian has invented a folding barrel or hogshead, to be used in transporting dry material. When not filled the heads are taken out and the staves rolled or folded up so as to occupy but little space, the time required to put it again into barrel shape being merely nominal.

The convention of iron and steel manufacturers in session at Cresson Springs, Pa., Sept. 12th, adopted a schedule of duties to be recommended to the Tarriff Commission, proposing as follows: Iron ore changed from 20 per cent. *ad valorem* to 85 cents per ton; pig iron increased from $7 to $8 per ton; cast scrap iron increased from $6 to $8 per ton; steel rails reduced from $28 to 22.40 per ton: steel blooms changed from 40 per cent. *ad valorem* to $20 per ton; steel and wire rods increased from 30 per cent. *ad valorem* to 50 per cent. *ad valorem*; steel in forms not otherwise provided for changed from 30 per cent. *ad valorem* to 3 cents per pound. Three representatives from each branch of the iron and steel industries of the country were chosen to lay before the Tariff Commission a schedule of proposed duties adopted.

A railway carriage painted inside with the Balmain phosphorescent paint is included in one of the trains between London and Rotherhithe, *via* the Thames Tunnel. Although only one-half of the available space of the carriage is painted, the phosphorescent light is quite sufficient to enable the passengers to distinguish small objects when passing through the tunnel; and, moreover, the light is powerful enough to enable a person to read the indication of an ordinary watch It is probable that the railway companies will be enabled to effect a considerable saving in gas and oil by using the phosphorescent paint.—*Boston Advertiser.*

Switzerland is progressive in the matter of internal improvements. She has two of the largest railway tunnels in the world, and is now arranging for two electric railways on the Edison plan. The contracts for construction have been given out.

One of the more recent uses of the electric light is in fishing. Some ingenious Frenchmen place the light in a glass globe and lower it in the water, at night, when the brilliant light attracts thousands of fish, which are easily surrounded with nets and caught.

The Georgia Pacific Railroad has been completed from Atlanta to Ringer's crossroads, forty-five miles. Nearly all the grading has been done between Ringer's crossroads and Anniston, Ala., and in October they will begin the running of trains through to that place. Thirty miles of the road have been completed from Greenville, Mississippi, to Johnsonville, and a branch road twenty miles long has been completed from Stoneville to Sharkey. The entire road, from Atlanta to Greenville, Miss., will be 462 miles, and of that 262 miles have been let and partially completed.

Some Points in the Labor Question.

One of the great advantages afforded by liberal wages to an industrial population is the special opportunity which thrifty and ambitious workmen enjoy for saving money, and eventually becoming proprietors in their turn. To save money in this way, even for such a purpose, costs a struggle, no doubt, but no success in this world that is worth having is ever attained without a struggle, oftentimes a long and bitter one. Only those who have tried it successfully know so well how great a help even a small sum of money may sometimes prove to be.

In countries where wages, at most, afford only a bare subsistence in any event, workmen rise from the ranks by the force of special qualifications or special circumstances, but in few instances as compared with this country. Persons who are familiar with the greater number of mechanical inventions and improvements which are due to the efforts of workers for wages, as compared with those due to the efforts of persons self-employed, can scarcely fail to discover that to this cause, more than to any other single cause, can we attribute the remarkable advancement of this nation in the mechanical arts.

In this connection, it may be noted that much of the dissatisfaction with which many workmen are led to regard the conditions of modern life, as compared with what they fancy would have been the case had they lived in past centuries, is founded upon an erroneous assumption. Unless a man sets out to find fault with Providence for not bringing him into the world as the son of rich or distinguished parents, he must concede that for him the only fair comparison with other periods of the world's history, is a comparison of his own lot with that of persons in like circumstances and pursuing like employments. Whoever attempts this comparison will end by pushing it back through communities which regarded manual labor as disgraceful, to those which held the laborer in feudal or other bondage as a serf, or little better. He will end by pushing it back through communities in which no workman could hope to start his children on a higher plane of life than his own, to those in which not even royalty had glass in its windows, or enjoyed what we should call common home comforts.

Combined with liberal wages, the chief aid an aspiring mechanic, or any man, can desire to possess is the habit of thought. The ability, more often the willingness, to think out a system of details or a course of action, advancing logically step by step from the incomplete or imperfect something that is seen, to the complete and measurably perfect everything that thought invents, is the one great point of vantage that many mechanics miss.

After all, invention is only suggestion. The man to whom nothing is suggested by what he sees is the man who never can by any possibility build a machine, or a business, or a home out of nothing. In nature, gaps and chasms are abhorred. Nature never designed either in the physical world without at the same time devising means to pass it. So in mechanics, in business, or in life, the clue to the means by which obstacles may be passed is the one thing to be looked for. The difficulty with most men is that they are impatient, and look too far to find it.

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NEW YORK, OCT. 7, 1882.

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The Iron Trade Situation.

The termination of the long lock-out at the Western Iron Mills by the final acceptance of last year's scale of wages by the iron workers, has awakened considerable fresh interest in the trade. For more than three months and a half the mills in Pittsburgh and other iron manufacturing towns in West Pennsylvania and Ohio, were idle. At the beginning of the lock-out bar iron sold from store in New York City on a basis of 2.6 to 2.7 cents a pound, and 2.5 at the mills, with a disposition to shade prices one or two-tenths of a cent. Large stocks had accumulated at the mills, and the market was weak. Prolonged idleness in the producing region merely stiffened prices at first. After a time an advance of about one-tenth of a cent a pound was made. Store prices in New York are now upon a basis of 2.7 to 2.8 cents a pound for refined bar. The mills have started up with no stocks on hand to mention, and with a supply of new orders.

The demand, while fair and steady, is much less than it was last year. Had the mills continued to run all summer, the result would doubtless have been to overstock and depress the market to an alarming extent. As it is, the manufacturers are probably in a stronger condition than they would have been without shutting down; but the workmen have lost very heavily, and the general wealth of productive industry has, of course, been depleted by the long idleness of such a body of producers. Last year the orders for railway material were immense, giving iron mills all they could do at remunerative prices. Railroad orders this year have been much less, and, in some cases, those already given have been canceled. The cause of this change is attributed to the decline of railroad securities in the open markets. The future of the iron market will depend quite largely upon the placing of contracts for new railroads. If the public at large are willing to invest as freely in opening new lines for the next two years as they have been for the two years past, iron mills will have plenty of business.

An Association of Patent Agents.

We learn from a late issue of *Engineering* that an association has been formed in England called "The Institute of Patent Agents," whose object is to separate the reputable members of that profession from those whose operations tend to bring discredit upon all persons having any connection with the business of soliciting patents. The membership is divided into four classes, viz.: Fellows, Associates, Foreign Members and Honorary Members, under variously specified conditions as to admission. A candidate for the class of Fellows must either have practiced on his own account for at least five years in Great Britain, and have acquired a good repute; or, he must have been for at least seven years engaged as a pupil or assistant in the office of a Fellow of the Institute, and have acquired knowledge qualifying him to practice; or, he must pass an examination in patent law and practice, mechanical drawing, and such other technical subjects as the council or examiners may impose.

The objects of the association include the promotion of improvements in the Patent Laws and in the regulations under which they are administered, framing and establishing rules for the observance of patent agents in all matters appertaining to their professional practice, extension of their opportunities and facilities for meeting, correspondence, discussion, and interchanging ideas respecting matters connected with their professional practice, and generally aiding the acquisition and dissemination of knowledge appertaining to their profession.

That such a society will be of benefit in England is not more plain, than that a properly constituted body of this kind would be of immense advantage to industrial interests in this country. Hardly a week passes that we do not receive an inquiry from some person asking the address of a *reliable* patent agent, and stating that he has been swindled by some one claiming to be a reputable member of that profession. Accepting our own experience in this direction as an indication of the prevalent state of morals in that business, the number is legion, of inventors that are daily receiving bad advice from solicitors, whose only object is to get out a patent, whether worth having or not. Some insignificant kink or quirk that forms no reasonable basis for anything costing either time or money, is recommended as the fit basis for a patent, in cases where nothing more can be claimed, the idea being that a patent must be had, whether decently obtainable or not. Patent agents whose character and mode of doing business are above reproach should see the advantage of forming themselves into an association, into which shysters and bad advisers are not permitted to enter. A certificate of membership in such a body, if rightly constituted, would form a guarantee which few inventors could afford to disregard.

A Neglected Industry.

The disadvantage, to the honest portion of the community, of the contract system, as applied to convict labor in the State, County and City prisons of this country, has been often and forcibly set forth. So far, the idea that our prisons must be made "self-supporting," or made to "pay," has too many fascinations to be resisted by our lawmakers. Any plan that can be suggested, having a tendency to make the prisons more self-supporting or make them pay better, should therefore meet with ready acquiescence from the people's representatives.

Now it is clear that the more prisoners any State has, to hire out at 40 cents a day, the more money it will make out of the transaction. It follows, that any measures which will increase the number of convicts in its prisons will be to the interest of the State, the idea that the State owes any duty to its unconvicted population being too absurd for argument.

No one who has observed the improvements that have been made in other machinery and tools, during the past few years, and has had opportunity to examine any of the tools employed by the unsuccessful burglars whose failures are daily being recorded in the newspapers, can fail to see that much of their ill success is due to the fact, that they were obliged to work with clumsy, or unpolished, or otherwise imperfect tools. It is notorious that the secrecy and caution which manufacturers of burglars' tools are now obliged to observe in conducting their business, must necessarily affect the quality of the manufactured product. Instead of compelling burglars to work with tools roughly forged out in dark cellars, or what is little better, tools shipped to this country from abroad because critical cracksmen in the countries from which they come do not consider them good enough for use in important cases, the State should take prompt measures to advance a neglected industry, and at the same time make its prisons still more "self-supporting," by increasing the facilities for burglary and consequently the number of burglars.

The various States which should adopt the systematic manufacture and sale of improved burglars' tools, as part of the daily routine of their prisons, would accomplish still another result that is worth noting. The convicts who, under the contract system, are set to work to manufacture burglars' tools at a cost with which outside manufacturers cannot hope to compete, would correspondingly lessen the number of men employed in other branches of manufacture, and equally, of course, the clamorous displeasure with which outside workmen dependent upon those trades now naturally view the competition of their convict co-laborers.

By using the ample resources of the State in the erection and equipment of suitable buildings and plant, and studiously refraining from taking the interest on this investment into account in figuring up the profits, there can be no doubt that the State can offer inducements to contractors to engage in the manufacture of improved burglars' tools. Perhaps the mere assurance by the authorities that the development of this hitherto neglected industry will not be looked upon with disfavor in any official quarter, will be, in most cases, a sufficient inducement. It follows logically, therefore, that under such auspices the ranks of the burglarious profession will be largely and continuously recruited, and with only reasonable diligence on the part of our courts and juries, the number of convicts employed in our prison at 40 cents a day will be correspondingly swelled, to the manifest financial advantage of the State or municipality adopting this plan.

Dangerous Shaft Couplings.

Frequently the daily papers are called upon to record another loss of life by having the clothing caught by the projecting screws, bolts, nuts, or sharp angles of shaft couplings, and being drawn around the shaft until torn to pieces. These horrible disasters are generally termed accidents, and the blame is placed only upon the individual who is slaughtered. The blame ought to be fastened upon the proprietor of the establishment where such shaft couplings are permitted to be used in exposed places. There is no need of using couplings with projections in any situation. Various forms of excellent shaft couplings are used without points to catch upon anything while in motion. Many of them have been illustrated in our columns, and they may be either made or purchased by any establishment. The destruction of life and limb through being caught by shaft couplings is generally due to the most inexcusable negligence on the part of proprietors.

Mechanics in New York City have some advantages for self-improvement in leisure hours not open to those in other cities. In addition to the free night school of Science and Art in Cooper Institute, the large library and reading-room of that institution affords means for acquiring technical and general knowledge of inestimable value. The library is open until 10 P. M. every week-day; also Sunday afternoon and evenings. It is filled with many thousands of books such as mechanics and others should read or use for reference, and, thanks to the generosity of its founder, the philanthropist, Peter Cooper, it is free to all. Then there is the Apprentices' Library at 18 East 16th street, which contains 65,000 volumes. During the past year the library has circulated 163,000 volumes, and only twenty-five volumes were lost. This also is free, it being supported by the General Society of Mechanics and Tradesmen. It is open to 9 P. M., and during the last year 36,000 persons have availed themselves of its privileges. The Astor Library has an immense collection of books, and is free; but, as it is open very little more than during bank hours, mechanics, while regularly employed, can obtain no benefit from it.

The Ladies' Floral Cabinet is the title of a handsome illustrated monthly publication which has recently passed under the editorial and business control of Ralph H. Waggoner, a journalist of ability and experience, and has been much improved by the change. It contains 16 pages, and is printed on good paper. It presents much information relating to the cultivation of flowers and to floral adornment, given in a sensible and practical way, that will be of interest in very many homes. Four pages are devoted to a continued story, which we think could have been put to a more legitimate use, but as the story was begun under the former management, doubtless its completion is necessary under the new. Be this as it may, the idea of home adornment is one that should receive more attention, and we take pleasure in commending this publication heartily to our readers. It is published at 22 Vesey street, New York; subscription price, $1.25 per year, with special terms to clubs.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(339) C. H. B., Elizabeth, N. J., asks some very sensible questions which will be duly answered when he gives his full name and address.

(340) A. A. W., Harrisburg, Pa., asks: Please give me a rule for making shrink fits, such as crank-pins, or cranks for stationary engines of various sizes. If you know of no such rule, please tell me what to allow for shrinkage on a disc 30″ in diameter and 4″ thick, hub 10″ diameter and 8″ thick, with a hole for shaft of 6″ diameter, crank-pin hole 3½″ bore and 4″ deep, straight holes. Please give whatever information you can, as I am an apprentice and would like to know. *A.*—The allowance for making shrink fits differs very much among mechanics and is more a matter of judgment than anything else. As, for instance, two men will hardly agree as to the allowance for a shrink fit upon a crank disc similar to the one you describe, but will each argue their own points well, and when the work is accomplished it will be a very difficult undertaking to prove which was correct. For making shrink fits there is no recognized rule, but allowance is made according to the quality of the materials to be operated upon. Strong, tough cast iron will stand very much more than hard and brittle castings, while in shrinking a light wrought iron band upon cast iron a large allowance may be made without any apparent harm. If the band is very thick and is to be shrunk upon a firm and unyielding substance the allowance must be made with great care, whereas if the substance is elastic less care is necessary in making the fit, as greater allowance may be made. A safe, general rule for shrink fits is, not to allow enough to stretch the band. A sufficient allowance will make a good fit, but beyond that the metal is stretched and made weaker than it would otherwise be. You doubtless know what would make a tight driving fit with a heavy sledge, and if you allow that much, the probability is that you will have no trouble as the hole in the disc will be smaller after it cools than before it was heated. On steel locomotive tires the usual allowance made for shrink fits is 1-100″ to each foot of diameter, or for a wheel of 5′ diameter the allowance would be 1-20″. With this allowance there has been no trouble experienced from the tires getting loose.

(341) C. K., New York, asks: Will you give me dimensions of a steam engine cylinder of 2″ bore. I desire its length and thickness of shell, also thickness of piston and diameter and length of piston rod. Would brass be better than iron to make such a cylinder of? *A.*—You do not say what you wish the speed of your engine to be, the boiler pressure to be carried, or for what purpose you wish to use your engine; neither do you intimate that it is to be of the horizontal or vertical type. All this information is necessary before we can answer you intelligently.

(342) T. W., Brooklyn, N. Y., asks: 1. Will you be kind enough to tell me if it is good practice to line the boxes on the crank-pin of the connecting rod with babbitt metal when they are worn out, or is it best to throw them away and get a pair of new ones? *A.*—Babbitt them by all means. Put the brasses in the strap and spread them apart as when new by putting liners between them. Drive the key against a block placed between it and the brasses, chuck them upon a face plate, recess and tin the brasses for the reception of babbitt. Use the best babbitt metal and you will have no trouble. The large locomotives, class K, on the Pennsylvania railroad have side rods with solid babbitt boxes, and they work well. 2. Which is the best way to line up the guides? *A.*—Remove the cylinder head, piston, crosshead and connecting rod, then stretch a fine sea-grass, or silk line, middling tight, through the center. One end of this line should be made fast to a piece of iron attached to one of cylinder studs, while the other end may be fastened to a board clamped to the crank end of the bed plate. To set the line precisely central, take a round soft pine stick and cut it about ⅜″ shorter than the radius of the cylinder and drive a common brass pin into the end, using this as a gauge to set the line by. The pin may be drawn out or pressed in to suit the exact distance. The line should be set in this way by measuring at both ends of the cylinder. When the line has been set perfectly true, with a short stick measure from the sides of the piston stuffing-box to see if it is in the center. Frequently guides have been lined up by the stuffing-box and the opposite end of the cylinder. When the engine was put together it worked badly from the fact that the work had been done with the supposition that the stuffing-box was in the center, which was not true. Set the line as described, then set the guides by the line using a straight-edge or any other suitable gauge applicable to the shape of the guides.

(343) W. J. T., New York, writes: Your answer to my question (303) was correct, but my friend says that he has not lost, but insists that I am the loser. The question now is, what constitutes the stroke of an engine, whether it is the distance the piston travels one way, or does it take one revolution of the crank to make the stroke? *A.*—The distance traveled by the piston in one direction during one half revolution of the crank constitutes one stroke, while the distance traveled by the piston during the other half revolution of the crank constitutes the other stroke of the engine, thus making two strokes of the piston to each complete revolution of the crank.

(344) W. B. G., New York, writes: I have a device for indicating the height or quantity of water in a steam boiler. This device may be placed in any locality above the boiler. It can be made with a pointer and scale or with a glass tube as desired. It will have about the same external appearance as the ordinary water gauge attached directly to the boiler. I wish to ask would an indicator as described be of any advantage to the engineer where his location is above the boiler room; also is there any indicator, similiar to what I have described, in the market? *A.*—A water gauge or indicator which would accomplish the object claimed for your apparatus would be very desirable, and if thoroughly reliable would be deeply appreciated by engineers and manufacturers generally. A glass water gauge of this description was on exhibition at the fair of the American Institute, two or three years ago. It consisted of a glass of the usual style, each end of which was connected by a small copper pipe with the water glass proper upon the boiler. We believe that this gauge was not regarded as an entire success.

(345) H. A. M., Cleveland, O., writes: To harden small steel tools such as drills, I dip them in molten lead to heat them; then quench in water. This leaves a small quantity of lead upon the tools, also a disagreeable black color which I desire to remove. I am not much troubled by the lead, as I use strictly pure metal melted in a crucible. Also will drawing in a hot air oven or an air tight box filled with charcoal leave the drills brighter than drawing in sperm oil after the dark color has been removed? *A.*—A dark color upon drills is not objectionable. What is wanted is durable drills that will do the work required of them more than appearances. If you will boil oatmeal so as to make a thin paste and dip the drills in it before heating them in the lead bath they will come out clean. We would advise you to draw the temper in oil rather than in dry air.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

For Sale—A valuable patent, Improved Tack Hammer. For paticulars address, R. H., Box 74, Silver Creek, N. Y.

A lot of 25″ lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

"Steam Economy," 124 pp., cloth, $1.00, by mail, points out remedies for defects in engines. Best indicator practice. A. Wilkinson, 123 n. 4th St. Phila.

Mechanical Engineering.—To learn inventing, designing and construction of machinery at school. Address, S. W. Robinson, Ohio State University, Columbus, O.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users and engineers. [Mention this paper.]

We will pay 25 cents each for copies of the AMERICAN MACHINIST for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Rocks, Minerals and Stocks; by Frederick H. Smith, Consulting Engineer and Geologist. Contents: Part I. World Building, Prime Minerals and Rocks, the Formation; Part II. Gold and Silver, Industrial Metals, Coal and Oil, Industrial Minerals, Precious Stones; Part III. Stock Companies, Stock Dealing, Stock Tricks. *A vade mecum* for the use of everyone interested in these important topics. Scientifically accurate, witty, fascinating. *Sui generis* among technical books. Handsomely bound in cloth, $1.50, in paper, 75 cents. Order through your bookseller, or address The Railway Review, 182-184 Dearborn St., Chicago, Ill.

MANUFACTURES.

Palmers & DeMooy, Cleveland, O., are building a large addition to their iron foundry.

Jerome B. Secor, Bridgeport, Conn., has a single order for 2,500 toy sewing machines. The machines sell for $3 each.

Lathe & Morse Tool Co. and McMahon & Carver, Worcester, Mass., are about to bring out new iron planers.

The new works of the Ward Axle, Brake and Coupling Company at Monongahela City, Pa., cover 120,000 square feet of ground, and are fitted with new machinery.

The Pond Engineering Co., 709 Market street, St Louis, Mo., has lately opened a new branch office in Chicago, Ill., for the introduction of the Jarvis Furnace in that city and vicinity.

The Corry City Iron Works, Corry, Pa., are putting up a new machine shop 60x40 feet, two stories in height, which will nearly double their capacity in their engine and boiler department.

The Hot Polished Shafting Co., Youngstown, O., has elected L. E. Cochran, President, and M. S Tracy, Secretary and Treasurer. The company have contracted for the necessary buildings, and will commence manufacture in a short time.

The Curtis Regulator Co., of Boston, have received an order from the Westbrook Manufacturing Co., for some of their large steam traps, it being their fifth order for Curtis regulators and traps.

B. B. & R. Knight, are erecting four Babcock & Wilcox boilers at their Mauchaug mill, Mauchaug, R. I. These will be set with the Jarvis furnace, and is the second order for this system of burning cheap fuel.

The Boston & Lowell Railroad Company has recently purchased a tract of about 15 acres of land in Lowell, Mass., between the Salem & Lowell and Boston & Lowell Railroads for the purpose of establishing thereon the several repair shops now located at East Cambridge.

The capacity of the Akron Iron Co.'s rolling mill, Akron, has just been increased 40 per cent., at an expense of $35,000 to $40,000; the steam capacity is now 1,000-horse power, an increase which will necessitate a force of 325 men, with a monthly payroll of $20,000. The cause of this increase is the popularity and rapidly increasing demand for their patent hot polished shafting.

M. C. Jones, formerly with Cohoes Iron Foundry and Machine Co., now at 110 Liberty street, N. Y., is resetting four Harrison boilers and is soon to put in for Waterbury Button Co., and Benedict & Burnham Manufacturing Co., Waterbury, Conn., his improved Boiler Front Jamb Plates. We also understand Mr. Jones has made large improvements during the past year in his boiler settings.

Owing to their large increase in trade during the past few years, the Baltimore (Md.) Car Wheel Company are now building entirely new works, located in another part of the city. The grounds cover an area of ten acres. The machine shop is 100x60 feet, two stories in height, and the foundry 360x60. Two cupolas will be used, and they will have a capacity of turning out 400 car wheels per day.

The Hazard Manufacturing Co., of Wilkesbarre, Pa., have just completed for the Central R. R. of N. J., the largest wire rope ever made by machinery. It is 2½″ diameter and 5,780 feet long (over a mile). The weight of it is 32 tons. It will be used on the Ashley inclined plane, below Wilkesbarre, and will pull 24 nine ton cars each trip. The life of such a rope is capable of hauling up the incline eight million tons of coal.

The Fitchburg Railroad shops at Orange, Mass., when the new buildings are completed, will consist of a foundry, 120x50 feet square, 18 feet high from the floor to the cross ties; milling room, 20x42 feet square; stack room, 20x32 feet square, with a stack 56 inches in diameter and 56 feet high; and a core room, and three sand bins holding three car loads each. The machine shop is 140x50 feet square, with a wing 50x50 feet square, in which is the forge shop, 50x32 feet square and 14 feet high.

At a meeting of the stockholders of the Wilson Sewing Machine Company of Wallingford, Ct., the following gentlemen were elected directors: W. G. Wilson, Samuel Simpson, E. M. Judd, G. W. Hull, R. B. Wallace, Elisha Whittlesey, L. M. Hubbard. The officers of the Company are: W. G. Wilson, president and general manager; R. H. Cowles, secretary and treasurer. No location has yet been selected, but will be soon, when active building operations will be begun.

Osgood & MacNaughton, Albany, N. Y., write us: We are happy to say we have received an order from the Panama Railroad Company for a Combined Steam Excavator and Derrick Car, such as was illustrated in the AMERICAN MACHINIST, August 19, 1882. We were one of several firms who put in bids for a machine for this Company. The award was given to us exclusively on the merits of our machinery, as we have reason to believe our bid was very much in advance of the others.

Howard & Bullough, manufacturers of textile machinery at Accrington, England, have opened a branch warehouse in Boston, at 209 Washington Street.

E. E. Garvin & Co., 143 Center street, New York, have just issued a new Illustrated Catalogue of 32 pages, containing descriptions with appropriate engravings and prices of their machine tools and appliances. This catalogue also contains tables of decimals equaling parts of an inch, for use in connection with the micrometer caliper. Other convenient tables are also given, as dimensions of wire gauges, sizes, etc.

Nichols, Shepard & Co., Battle Creek, Mich., manufacturers of threshing machinery, have just placed an order with the Ashcroft M'f'g Co., 111 Liberty St., New York, for 500 steam gauges with seamless drawn tubes, and a similar order with the Consolidated Safety Valve Co., at the same address for 500 "Pop" Safety Valves, all brass, each order being accompanied by a letter expressing their great satisfaction with the behavior of these devices in their business.

The *Industrial World* states that the Chicago Polished Steel Shafting Company, recently incorporated with a capital of $60,000, for the manufacture of polished steel shafting, has purchased five acres of ground in close proximity to the Calumet Iron and Steel Company's plant at Cummings, and is erecting thereon a building 60x100 feet. Besides $20,000 of machinery which will be placed in these works, improved machinery of Mr. Wm H. Whyte's will also be used. The works are expected to start up about Oct. 15th.

The Chicago, Milwaukee & St. Paul Railroad Company has begun the erection in the Menominee valley at Milwaukee of an immense building to be devoted to the manufacture of car wheels, and from it, when once in full operation, there will be turned out 150 wheels daily, or an annual product of 20,000,000 pounds of castings. There are at present employed in and about the various shops not less than 1,400 men, and the number will be increased to upward of 1,500 when the car-wheel foundry is completed. A fine roadway approach to the shops from Grand avenue has recently been completed at a cost of several thousand dollars.

One of the industries of Chesterfield Factory, N. H., from a time which takes the memory of the oldest inhabitant, is the manufacture of bits and augers, the standard quality of the product having insured a steady demand. This business, which for the past 25 years has been conducted by Benjamin Pierce, has recently been sold to three young men—Currier Brothers—who are pushing it energetically, working themselves at all the details of the business. They have already commenced to adapt new machinery to some of the processes of manufacture which they will continue as far as is found practicable.

F. B. Pierce, Chesterfield Factory, N. H., who manufactures brush handles and various other articles of wood, finds his increase of business such that he contemplates supplementing his water power with a steam engine. His water power is very constant but insufficient for the present purposes and the additions he proposes making. One of the curiosities of manufacture in Mr. Pierce's works is the old time spinning wheel, of which he finds sale for quite a number every year. Chesterfield is well situated with reference to obtaining the woods suited to his special products, which together with the local skill more than compensates for shipping facilities not entirely favorable.

The Westinghouse Machine Co., 92 and 94 Liberty street, New York, have just issued a new illustrated circular and catalogue, containing full descriptions of their new steam engines as well as direct connected and portable steam dynamo-electric machines. The details of their improved engine are fully described by the aid of plain engravings. The various advantages claimed for this engine are set forth in a plain, practical way and demonstrated by numerous indicator diagrams. A practical allusion is made to Damascus Bronze, explaining some of its peculiar mechanical properties. The company above mentioned have fitted up a special department for furnishing castings of this metal, they being the sole manufacturers in this country. The Westinghouse Machine Company also make the Alden crusher and pulverizer, for the reduction of limestone, iron, gold and silver ore. This machine is said to have reduced from 1,500 to 2,000 pounds of limestone to No. 10 siftings per hour.

The Detroit, Lansing & Northern Railroad Company has contracted for the construction of new shops at Ionia, Mich., as follows: Round house, 250 feet in diameter; turn-table pit, 50 feet in diameter; open court, 120 8 feet in diameter; locomotive pits, 4x35 feet. The machine shops, 110x250 feet; machine shop, 108x145 feet; blacksmith shop, 40x95 feet; boiler shop, 45x93 feet; tin shop, 14x45 feet; pattern shop, 15x47 feet; hall, 12x15 feet; office, 12x15 feet; tool room, 15x31½ feet; locomotive pits, 4x24 feet. Placed next to this is the transfer pit, 60x278 feet, with an iron table and six tracks. The car repair and paint shop is 80x280 feet. The repair shop, 78x141 feet; paint shop, 78x121 feet; paint and oil room, 14x66½ feet. Boiler house, 47x47 feet. Chimney, 102 feet high, with 5x5 flue. Store, 20x100 feet. The buildings are of brick, except the wood-working shop, which is of wood, and contains all the wood-working machinery, with an engine to drive it, steam being brought from the boiler house. The contract was awarded to Detroit parties for $111,459.80.—*Chicago Railway Review.*

Machinists' and Engineers' Supplies.

NEW YORK, Sept. 21, 1882.

During the past week the supply business has fallen off somewhat, but no apprehension is felt in regard to a satisfactory fall trade. Some of the dealers appear to relish a small "let up," as they call it.

Schaffer & Budenberg, represented by W. Heuermann, 40 John street, New York, now have in stock a supply of No. 6 of their new Exhaust Steam Injectors. Size No. 5 are being cast, and a full supply of the smaller sizes will shortly be forthcoming.

The Ashland Emery Co., Perth Amboy, N. J., manufacturers of Turkish Emery, have issued a new circular in which they state that trade in their line is unusually good and that quotations are slightly lower than ever before.

Iron and Metal Review.

Buyers of Pig Iron are still inclined to pursue their hand to mouth policy and they still appear apprehensive. Since the strikes are ended the furnaces and mills may be expected to start as soon as the necessary arrangements have been completed. We quote prices as follows: Foundry, No. 1, $26; Foundry, No. 2, X, $23.50 to $24.50; Grey Forge, $20.50 to $21.50. Prices of Foreign Iron are slightly firmer owing to an increase of ocean freights and an advance of prices on the other side. We quote as follows: Coltness, $26.50 to $27; Glengarnock, $24 to $24.50; Gartsherrie, $25.50 to $26; Summerlee, $25.50 to $26; Carnbroe, $24; Eglington, $23 to $23.50; Langloan, $25.50 to $26; Old rails quiet at $27 for Tees and $30 for double-heads. Wrought iron Scrap $28 to $30. Bar Iron is in slow demand at 2.06c. for large lots. Copper is quiet at 18c. to 18¼c.; Banca Tin, 28c; Straits and Malacca 25¾c. to 26c.; Billiton, 26c.; Australian, 25¼c.; Lead, Common, 5.10c.; Refined, 5.15c.; Antimony, Hallett's 11.; Cookson's, 13.; Nevada, 12½. Spelter Common Domestic, 5.40c. to 5.60c; Refined, 8c. to 8¾c.; Silesian, 5.45c. to 5.55c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—Situation as Engineer by competent engineer and machinist. Address D, this office.

Wanted—a position as foreman, by a practical machinist, tool maker and die sinker. Address P. O. 474, Rome, N. Y.

Wanted—Engagement by mechanical draughtsman and machinist, technically educated. Address P. O. Box, 352, Hamilton, Ohio.

A first-class mechanical draughtsman, practically and theoretically educated, desires a situation. Address, "T," P. O. Box, 1397, Providence, R. I.

Situation desired as Assistant Draughtsman, Steam Engines and General Machinery. Five years practical experience. Technical education. Age 24. Box 12, AMERICAN MACHINIST.

A man of experience with steam engines and general jobbing, wants a situation to take charge of work. Correspondence solicited. Address, Box 503, Defiance, O.

Machinery designed, construction superintended, leveling, Patent office drawings, copying and tracings. Charges reasonable. Wm. D. Skidmore, M. E., 367 Nostrand Ave., Brooklyn, N. Y.

Wanted—By a mechanical engineer of means and standing, a position as superintendent, where duties are not laborious physically, or would take an interest financially in a small thriving concern. Address X, Box 2714, New York City.

Wanted—A situation as Superintendent or Foreman in a shop where steam engines and general machinery are built, by a man of large and varied experience in such work. New York reference. Address, Geo. Shires, 328 W. 30th N. Y. City.

Wanted—Situation as Superintendent or Assistant Manager in an established manufacturing company, by a thoroughly competent party who has held similar positions. Address, Manager, 31 Jefferson St., Brooklyn, E. D., New York.

Correspondence is solicited with a Mechanical Engineer, 40 to 50 years of age, who has had experience for his own account in both commercial and mechanical branches of the business. No objection to a person having been unsuccessful, unless same was the result of bad habits. To a competent man, if engagement is made, steady employment and good salary will be given. Address, Hickory 34, Station G., Brooklyn, N. Y.

For Sale-A Richards Indicator with three springs, new and complete. Address Indicator, Box 2, office AMERICAN MACHINIST.

A machinery manufacturing firm desires to buy gear and pulley patterns (stock patterns) either new or second-hand. Address, stating condition and prices, Patterns, care AMERICAN MACHINIST.

Forty-inch Hewes & Phillips screw cutting cross-feed lathe for sale. With raising blocks to swing 52", and 4-jaw chuck. George A. Ohl & Co., East Newark, N. J.

Second Annual Exhibition Fair
OF THE
New England Manufacturers' and Mechanics' Institute
IS NOW OPEN IN BOSTON.
The largest exhibition building in the United States. Ten acres of industrial exhibits, displaying the wonders of mechanism, Science and Art. The largest display of Machinery since the CENTENNIAL, all in operation, and showing the processes of manufacture. Carpet Weaving, Cotton Weaving, Silk Weaving. The great railroad display of Atlanta duplicated. The leading industries of the North, South, East and West fully displayed, making a NATIONAL EXHIBITION.
DON'T FAIL TO VISIT THE EXHIBITION FAIR.

THE
Greenfield Vertical Engine,
SOLD BY
COOKE & CO., FORMERLY COOKE & BEGGS,
Dealers in MACHINERY AND SUPPLIES,
6 Cortlandt Street, New York,
IS THE BEST IN THE MARKET.
Send for our prices before ordering Engines, Boilers, or other machinery.
AGENTS FOR
ROOTS' BLOWERS,
WATSON'S FORGES,
WATERS' GOVERNORS,
KEYSTONE INJECTORS,
Etc.

THE CURTIS STEAM TRAP.
Send for Circular stating advantages and superiority over other traps.
Manufactured by
THE CURTIS REGULATOR CO.
51 Beverly St.
BOSTON, MASS.
GENERAL AGENTS:
A. ALLER, New York, 109 Liberty St.
JOHN McKAY, JR., Philada., 135 North 3d St.
EDW'D J. MOORE, Baltimore, 8 South St.

JENKINS PATENT VALVES
THE STANDARD
MANUFACTURED OF BEST STEAM METAL.
JENKINS BROS. 71 JOHN ST. N.Y.

JEROME B. SECOR,
MANUFACTURER OF
Machinery and Tools,
IMPROVED WIRE FEED SCREW MACHINES, GUN AND SEWING MACHINE TOOLS, DIES FOR DRAWING, FORGING, BLANKING, &c., MADE TO ORDER.
Manufacturer of
THE SECOR SEWING MACHINE,
Factory Cor. Broad & Railroad Ave.
BRIDGEPORT, CONN.

"THE DEANE" STEAM PUMPS FOR EVERY SERVICE.
Send for New Illustrated Catalogue.
The Deane Steam Pump Co.
HOLYOKE, MASS.
92 & 94 Liberty St., New York. 54 Oliver St. Boston. 226 & 228 Lake St., Chicago.

Grey Iron Castings
Of superior quality for machinery and other purposes. Delivered promptly in New York. Estimates given. Castings finished when required.
Sedgwick & Stuart Mfg. Co.
POUGHKEEPSIE, N. Y.

LINK AND VALVE MOTIONS.
By W. S. Auchincloss.
Application of the Slide Valve and Link Motion to Stationary, Portable, Locomotive and Marine Engines. By William S. Auchincloss. Designed as a hand-book for Mechanical Engineers. Dimensions of the valve are found by means of a Printed Scale, and proportions of the link determined without the assistance of a model. With 37 wood-cuts and 21 lithographic plates, with copperplate engraving of the Travel Scale. 6th Ed. 8vo. Cloth. $3.00.
D. VAN NOSTRAND,
23 Murray and 27 Warren Streets, N. Y.
Copies sent, post paid, on receipt of price.

THE
M. T. Davidson Improved Steam Pump,
MANUFACTURED BY
Davidson Steam Pump Co.,
OFFICE & WORKS:
41 to 47 KEAP STREET, BROOKLYN, N. Y.
Warranted the Best Pump made for all Situations.
KELLY & LUDWIG, Agents, 49 and 51 North 7th St., Phila., 97 Liberty Street., New York.

The Steam Pumps
Made by VALLEY MACHINE CO., Easthampton, Mass., are the Best in the World for Boiler Feeding and other purposes.

Weston's Differential Pulley Blocks,
CAPACITIES FROM ½ TON TO 10 TONS.
ONE MAN CAN LIFT 5,000 POUNDS.
THEY HOLD THE LOAD SUSPENDED AT ANY POINT.
ALL SIZES IN STOCK.
THE YALE LOCK MFG. CO.
Manufacturers, Engineers and Machinists,
PRINCIPAL OFFICE AND WORKS, STAMFORD CONN.
SOLE MAKERS.
SALESROOMS:
NEW YORK—53 Chambers St. PHILADA.—507 Market St.
BOSTON—224 Franklin St. CHICAGO—64 Lake St.
40 page Catalogue of Light Hoisting Machinery furnished on application.
DIRECT BLOCK. GEARED BLOCK

BLAKE'S PATENT STEAM PUMPS.
MORE THAN 13,000 IN USE.
Adapted to Every Situation.
Send for New Illustrated Catalogue.
GEO. F. BLAKE MANF'G CO.
88 Liberty Street, NEW YORK. | 44 Washington St., BOSTON.

JARVIS PATENT FURNACE FOR SETTING STEAM BOILERS.
Economy of Fuel, with increased capacity of steam power. The same principle as the SIEMANS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire
Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c. A. F. UPTON, General Agent,
Send for circular. 7 Oliver St. (P. O. Box 3401,) Boston, Mass.
BERTON & NICKEL, New York Agents,
No. 92 Liberty Street.
POND ENGINEERING CO., Western Agents,
709 Market Street, St. Louis,
And 130 W. Second St., Cincinnati, Ohio.

THE CAMERON STEAM PUMP.
Is the Standard of Excellence
AT HOME AND ABROAD.
THE A. S. CAMERON
STEAM PUMP WORKS,
Foot of East 23d Street, New York.

Combination Dredge.
Dredges guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.
Capacity of Excavator, &c., 4 cubic yards per minute in gravel. Has proved very efficient and desirable in the hardest hard-pan. Derrick lifts 8 tons. Circulars furnished.
Combined Steam Excavator and Derrick Car.
OSGOOD & MACNAUGHTON, Albany, N. Y., Patentees,
Successors to RALPH R. OSGOOD, Troy, N. Y.

NICHOLSON FILE CO.,
SOLE MANUFACTURERS OF
FILES AND RASPS
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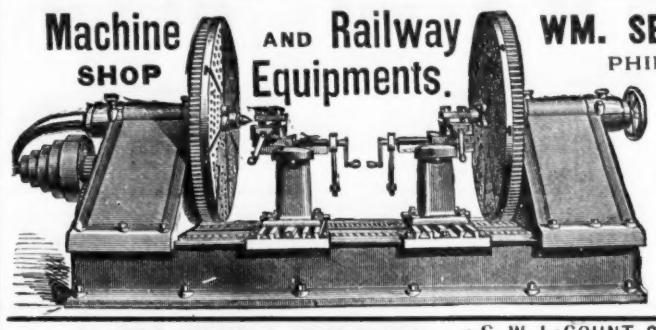
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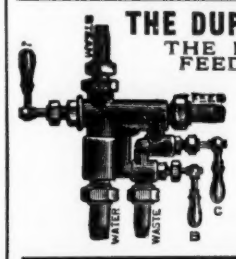

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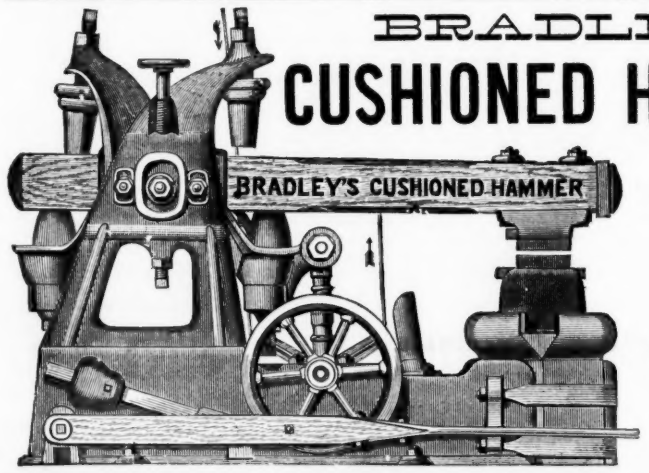

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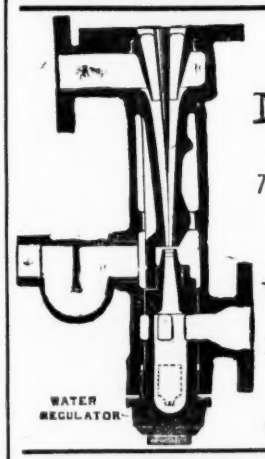

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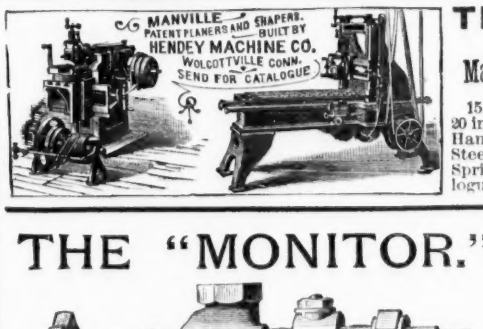

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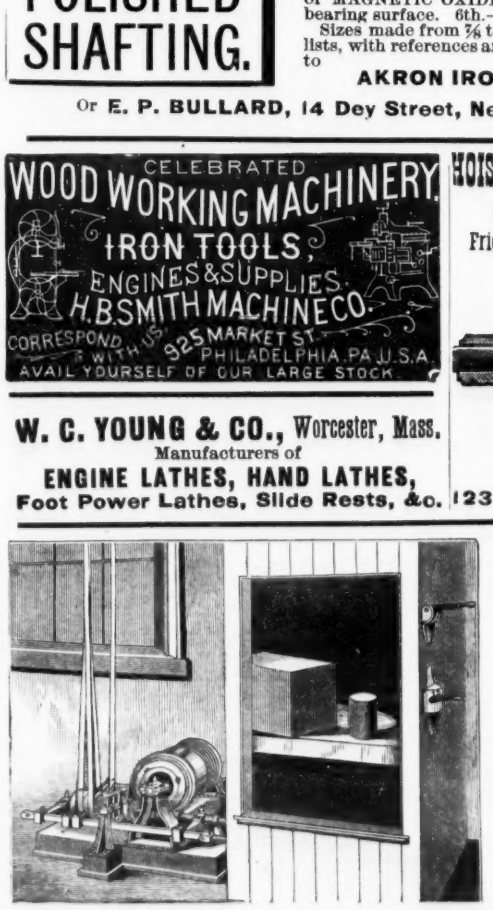

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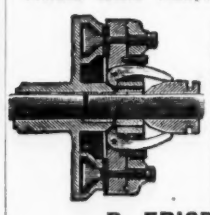
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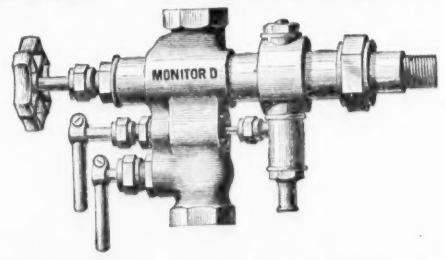

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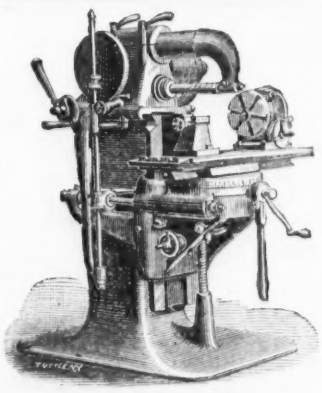
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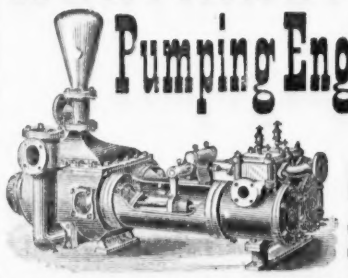
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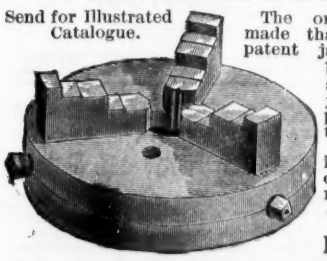

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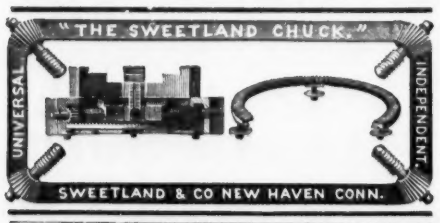

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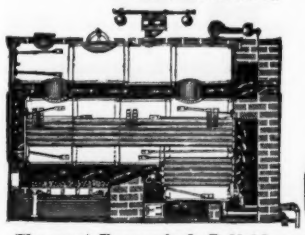

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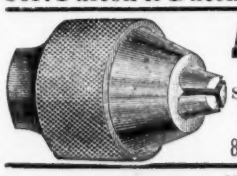

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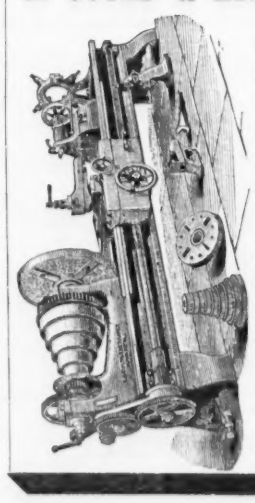

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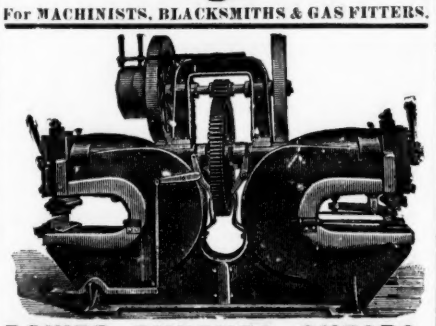

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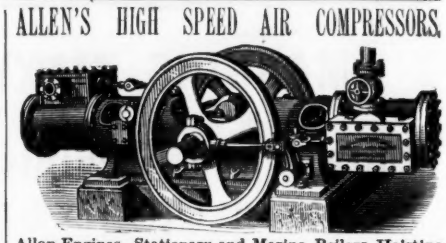

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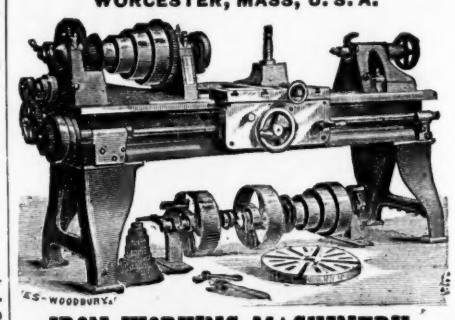

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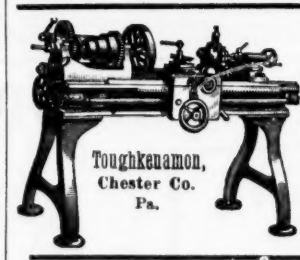

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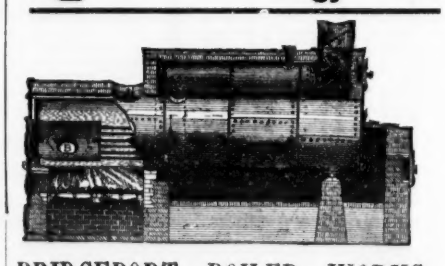

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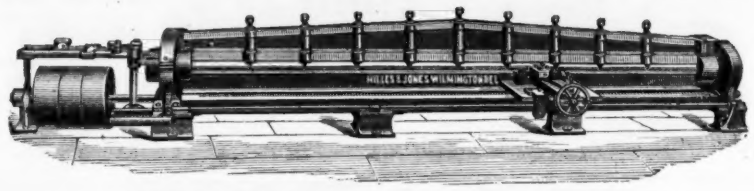

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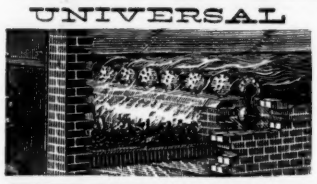

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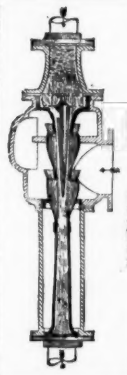

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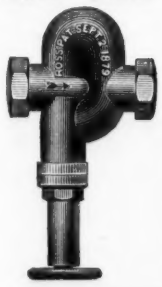

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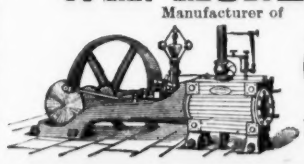

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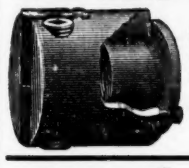

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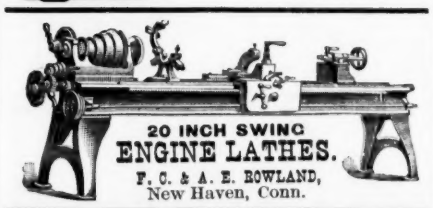

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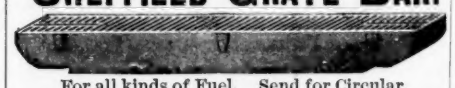

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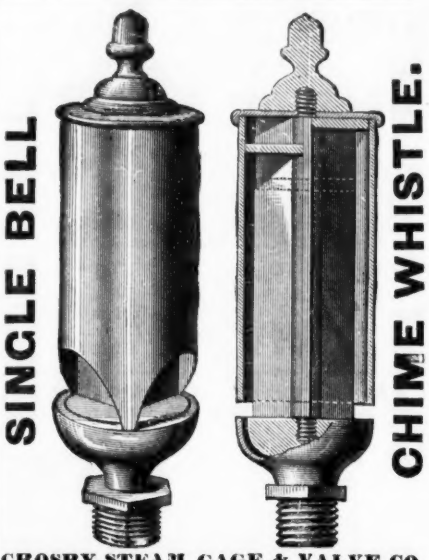

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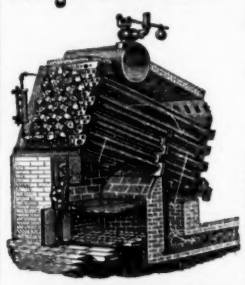

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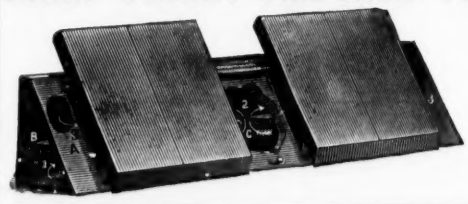

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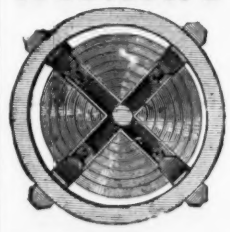

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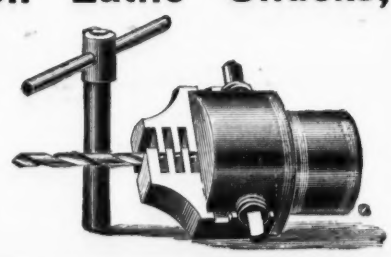

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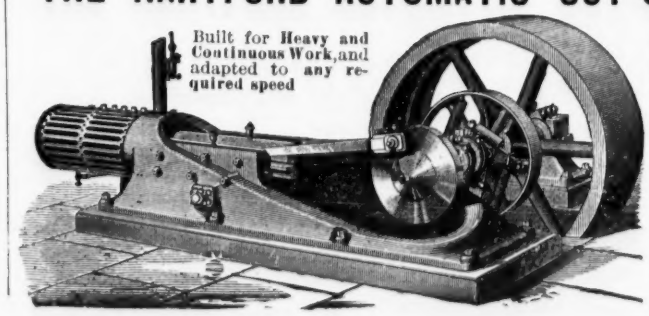

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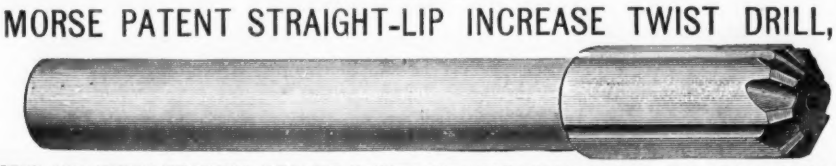

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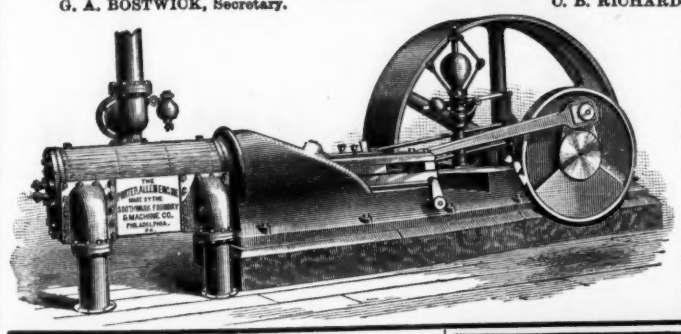

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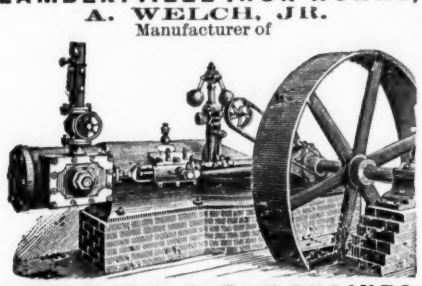

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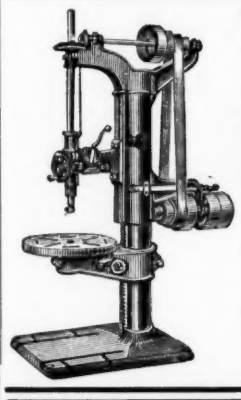

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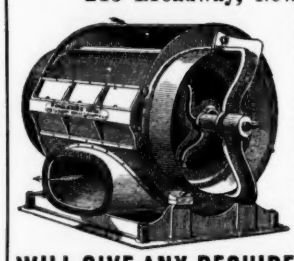

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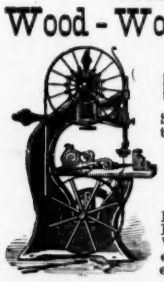

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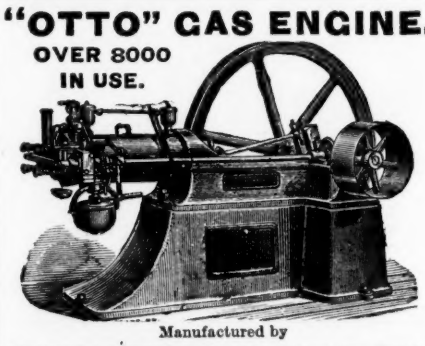

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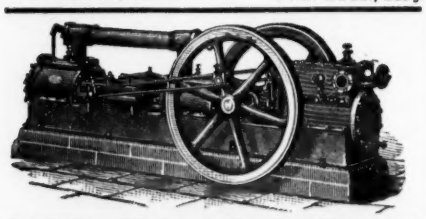

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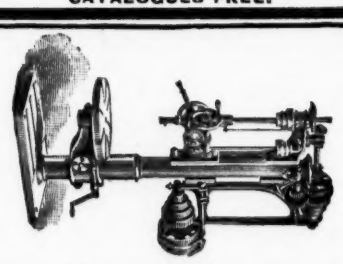

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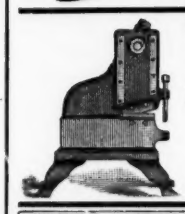

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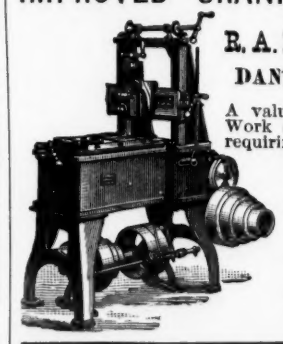

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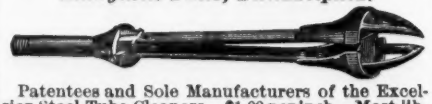

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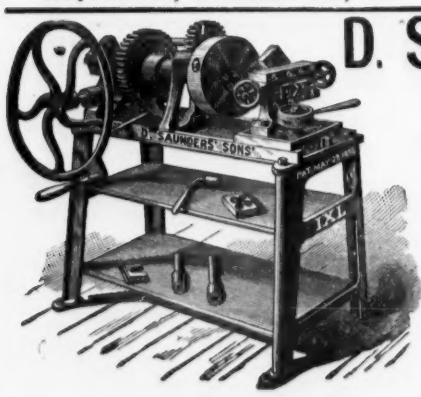

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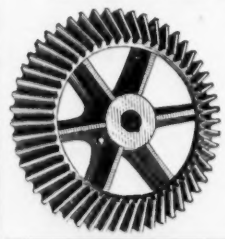

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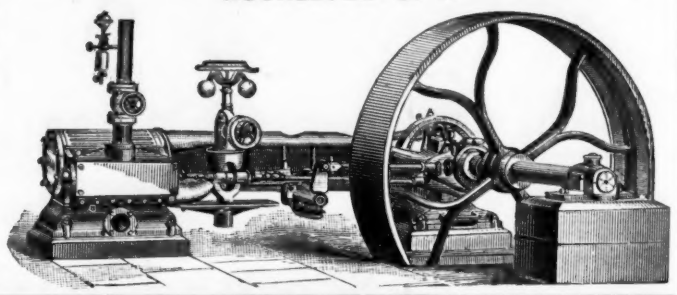

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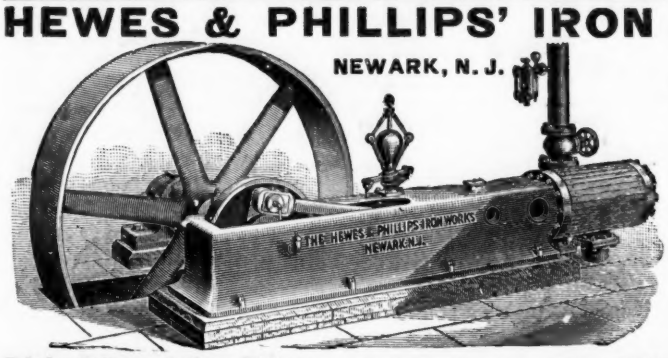

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36 inch x 36 inch x 9 ft., planer. 2d hand,	good order. Wheeler.
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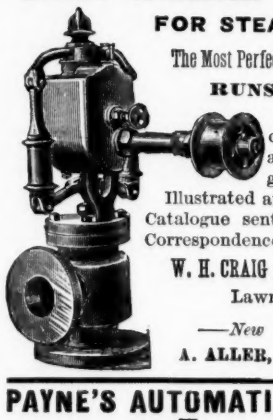

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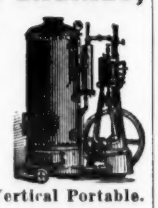

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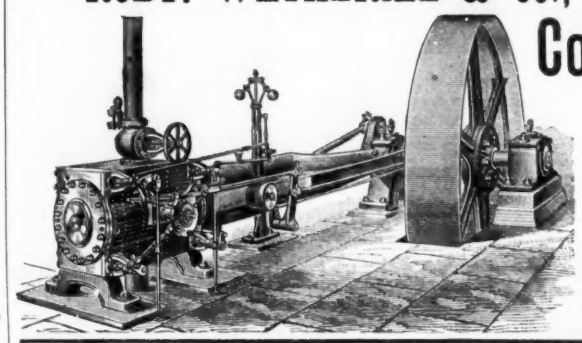

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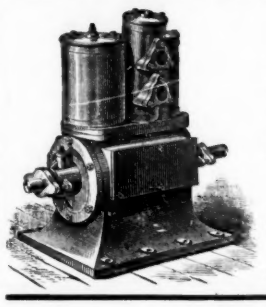

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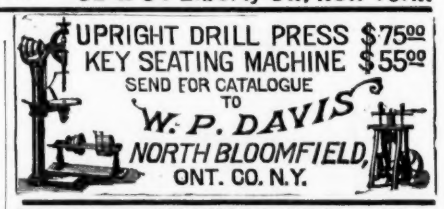

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1	26 in. swing, 14 ft. bed. Sept. 30th.
1	32 in. x 8 ft. Planers. New. Sept. 30th.
1	38 in. x 10 ft. " " " "
1	38 in. x 12 ft. " " " "
2	12 in. stroke Slotting Machines. New. Oct. 10.

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1	19 in. " 8 ft. " " "
2	18 in. " 8 ft. " " "
1	17 in. " 10 ft. " "
5	15 in. " 6 ft. " " "
1	Square Arbor Fox Lathe. New.
1	12 in. swing, 6 ft. Hand Lathe. New.
1	10 in. " 4½ ft. Bed Hand Lathe. New.
2	30 in. x 8 ft. Planers. New.
1	26 in. x 7 ft. Planer. New.
1	24 in. x 5 ft. " "
1	22 in. x 4 ft. Planer. New.
2	38 in. Swing Upright Drills. B. G. & S. F. New.
1	26 in. Drill. B.G.&S.F. New.
1	23 in. Drill. B. G. & S. F. New.
1	23 in. " Plain.
3	20 in. " "
1	18 in. Bench Drill.
1	4 spindle Drill. New.
1	3 " " "
2	4 " " Second-hand.
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One Special Shafting Lathe, 28 inch swing, 25 foot bed, to take 20 feet between centers.

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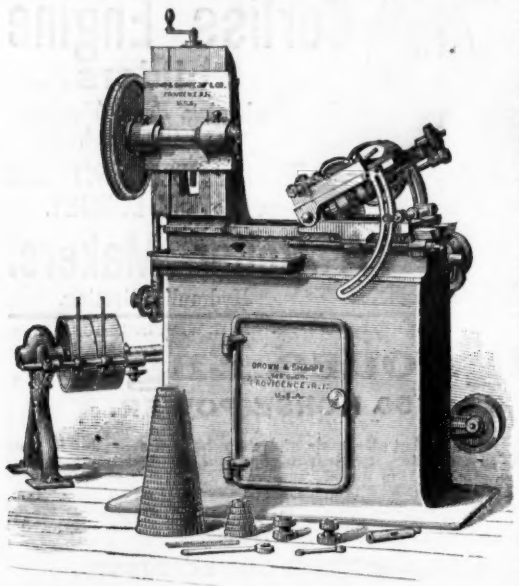

This machine was designed to meet the requirements of Cotton and Woolen Machinery Manufacturers, or others having large numbers of gears to be made. It is arranged for cutting both bevel and spur gears of sizes not exceeding eighteen inches in diameter, three-inch face, and not coarser than six diametrical pitch (about half-inch circular pitch). It is entirely automatic in all its motions, cutting through for each tooth, and revolving the wheel until all the teeth are cut, thus enabling the operator to attend to other work.

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A closet in the base of Machine affords a convenient place for cutters, change gears, arbors and wrenches.

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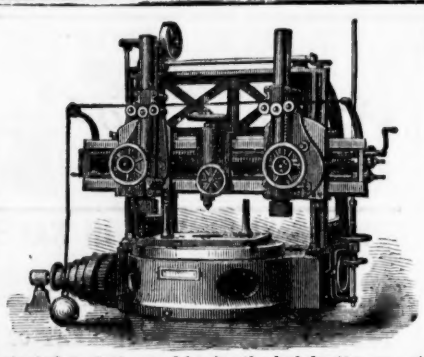

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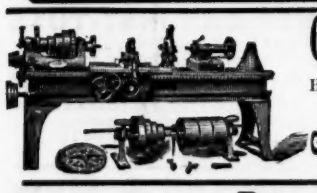

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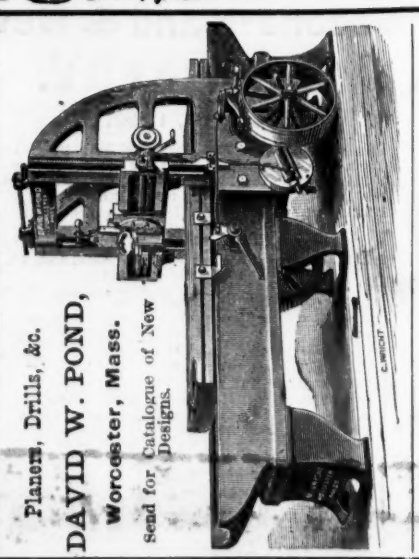

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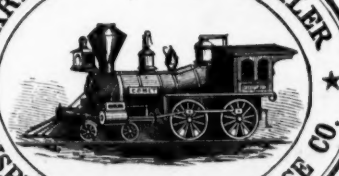

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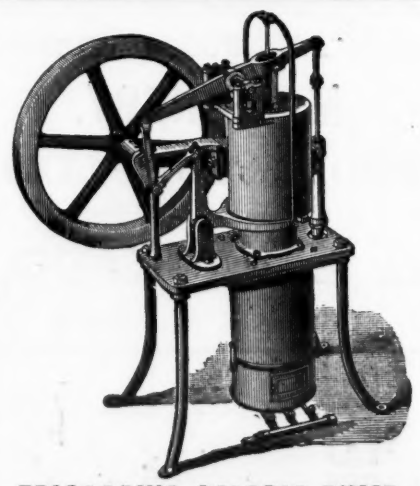

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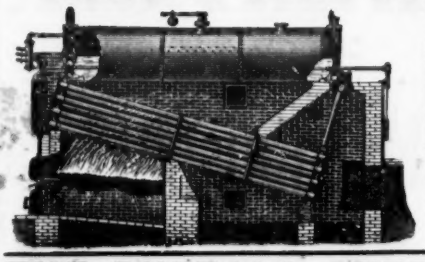

3,678 H. P. in use by SINGER MF'G CO., New York; 3,790 H. P. by HARRISON HAVEMEYER & CO., Philadelphia; 2,880 H. P. by DECASTRO & DONNER SUGAR REFINING CO., Brooklyn; 4,600 H. P. by AMERICAN GRAPE SUGAR CO., Buffalo; 1,350 H. P. by THE JESSUP & MOORE PAPER CO., Wilmington; 720 H. P. by RARITAN WOOLEN MILLS, New Jersey; 600 H. P. by STUDEBAKER BROS. MF'G CO., South Bend, Ind., and hundreds of others in all kinds of business, from 50 H. P. to 2,000 H. P. each.

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